INTERNATIONAL CONFERENCE

ON

METAVERSE-5.0 FOR SUSTAINABLE MANUFACTURING

Organized by

DEPARTMENT OF MECHANICAL ENGINEERING

GANDHI INSTITUTE OF ENGINEERING AND TECHNOLOGY UNIVERSITY

ODISHA, GUNUPUR

(HYBRID MODE)

DATE: 23rd and 24th January 2026

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REPORT OF THE INTERNATIONAL CONFERENCE METAVERSE-5.0

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The International Conference **METAVERSE-5.0**, organized by the Department of Mechanical Engineering, GIET University, Odisha, Gunupur, and held on **23rd and 24th January 2026**, served as a dynamic and intellectually enriching platform for academicians, researchers, and industry professionals from across the globe. The conference focused on the integration of Metaverse technologies with **Industry 5.0**, smart and sustainable manufacturing systems, digital transformation, and advanced engineering applications. Through keynote lectures, high-quality technical paper presentations, and interactive discussions, the event promoted interdisciplinary collaboration and meaningful knowledge exchange. The deliberations showcased cutting-edge research and innovative solutions to emerging industrial and societal challenges, reflecting GIET University's strong commitment to academic excellence, research innovation, and future-ready technological development.

The convener of the conference, **Dr. Kali Charan Rath**, addressed the gathering by outlining the theme, objectives, and overall agenda of METAVERSE-5.0, while emphasizing the importance of effective presentations and constructive discussions in advancing research outcomes. The **Chief Guest, Dr. S. S. Mohapatra**, highlighted the crucial role of technocrats and research scholars in adopting advanced perspectives and skill sets for product development aimed at solving industrial and societal problems. The **Guest of Honour, Dr. Dhiren Kumar Behera**, stressed the significance of industry-oriented research projects by academicians and scholars in nation-building, aligning research initiatives with the vision of **Viksit Bharat 2047**. The keynote speakers, **Dr. Arun Kumar Singh, Dr. Anshuman Das, and Dr. Arun Kumar Singh**, shared their rich experiences on cutting-edge technologies and their applications across various domains, engaging actively with participants and addressing queries during their sessions.

The technical sessions were effectively chaired by **Dr. Balaji Kumar Choudhury**, who critically evaluated the presentations and facilitated insightful open-house discussions with the presenters. Participants expressed high satisfaction during the valedictory session, sharing their research experiences and the value gained from presenting their work at this international forum. The **Best Paper Award** of the conference was announced by the convener during the valedictory function and conferred upon **Ms. Sanyogeeta Santosh Rote** (Sanjay Ghodawat University, Kolhapur) for her paper titled *"Numerical Analysis of Aerodynamic Behaviour of Various Shapes of Viewport on a Fuselage Structure."* The co-conveners, **Dr. Raghabendara Kumar** and **Mr. Santosh Kumar Tripathy**, actively interacted with speakers and presenters throughout the sessions. The

conference concluded successfully with a formal vote of thanks delivered by **Mr. Santosh Kumar Tripathy**, acknowledging the support of **Ms. Satgur Pyari Padmanabham** (Associate Business Development Manager-Cureus, Springer Nature) the GIET University management, officials, deans, heads of departments, faculty members, presenters, participants, media personnel, and all those who contributed directly or indirectly to the grand success of **METAVERSE-5.0**.

SHORT BIODATA OF CHIEF GUEST, GUEST OF HONOR AND KEYNOTE SPEAKERS

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Dr. S. S. Mohapatra is a distinguished academician and researcher associated with the National Institute of Technology (NIT), Rourkela. He has extensive experience in teaching, research, and academic administration, with core expertise in mechanical engineering and allied interdisciplinary areas. His research interests include advanced manufacturing processes, materials engineering, optimization techniques, and sustainable engineering solutions. Dr. Mohapatra has published numerous research papers in reputed international journals and conferences and has actively contributed to sponsored research projects, faculty development programmes, and professional bodies. He is widely recognized for his commitment to academic excellence, research mentorship, and contributions to engineering education and innovation.

Dr. Dhiren Kumar Behera is a senior academician and administrator currently serving as Professor and Head of the Department of Production Engineering at Indira Gandhi Institute of Technology (IGIT), Sarang, Odisha. He has rich experience in teaching, research, and academic leadership, with expertise in production and manufacturing engineering, operations management, and quality engineering. Dr. Behera has published several research papers in reputed national and international journals and conferences, and has actively contributed to sponsored projects, faculty development programmes, and curriculum development. He is well known for his dedication to student mentoring, research guidance, and his significant contributions to strengthening engineering education and research culture at IGIT Sarang.

Dr. Arun Kumar Singh is a Professor and Section Head in the School of Mathematics & Computer Science at PNG University of Technology, Papua New Guinea. He is an accomplished academician with extensive experience in teaching, research, and academic administration in the areas of mathematics and computer science. His research interests include applied mathematics, computational techniques, and emerging areas of computer science, with a strong focus on interdisciplinary applications. Dr. Singh has published research papers in reputed international journals and conferences and has actively contributed to curriculum development, faculty mentoring, and institutional academic growth. He is widely recognized for his commitment to quality education, research excellence, and international academic collaboration.

Prof. Dina Darwish is a renowned academician and accomplished academic leader, currently serving as Vice Dean of the Faculty of Computer Science and Information Technology at Ahram Canadian University, Egypt. She possesses rich experience in teaching, research, and academic administration, and has significantly contributed to the growth and quality enhancement of computer science and IT education. Her professional interests span emerging computing technologies, digital innovation, and interdisciplinary research. Prof. Darwish has played an active role in curriculum design, academic quality assurance, research supervision, and institutional development, while also fostering strong industry–academia linkages. Through her leadership and scholarly contributions, she continues to promote excellence, innovation, and sustainable development in higher education.

Dr. Anshuman Das is an Associate Professor in the School of Mechanical Engineering at VIT Chennai. He is an experienced academician and researcher with expertise in advanced manufacturing processes, materials engineering, and sustainable engineering practices. Dr. Das has been actively involved in teaching, research, and academic administration, contributing to curriculum development and mentoring undergraduate, postgraduate, and doctoral students. He has published research articles in reputed national and international journals and conferences, and his research interests align with emerging areas of mechanical and manufacturing engineering. Dr. Das also actively participates in conferences, FDPs, and collaborative research activities, thereby contributing to academic excellence and industry–academia interaction.

CHIEF GUEST

Dr. S S Mohapatra
Professor, NIT Rourkela
Engineering

GUEST OF HONOUR

Dr Dhiren Kumar Behera
HOD Department Production

IGIT Sarang Odisha

KEYNOTE SPEAKERS

Prof. Dina Darwish

Vice Dean of Faculty of Computer Science and IT
Ahram Canadian University, Egypt.

Dr Anshuman Das

Associate professor
School of Mechanical Engineering,
VIT Chennai

Dr. Arun Kumar Singh

Professor & Section Head
School of Mathematics & Computer Science
PNG University of Technology,
Papua New Guinea

AGENDA

DATE : 23.01.2026

3:30 PM TO 03:35 PM	**Inaugural Ceremony and Address By** **Convener: Dr. Kali Charan Rath**
3:35 PM TO 03: 50 PM	**Address By Chief Guest** **Dr. S S Mohapatra** Professor, NIT Rourkela
3:50 PM TO 04: 30 PM	**Address By Guest of Honour** **Dr. Dhiren Kumar Behera** **HOD, Department of Production Engineering** Department IGIT Sarang Odisha
04: 30 PM	**Vote of Thanks by** **Co-Convener: Mr. Santosh Kumar Tripathy**

The second day of the conference (24.01.2026) commenced with an insightful keynote address by a distinguished expert in the field. This was followed by well-structured technical sessions, where researchers and academicians presented and discussed their innovative research contributions.

FEW CLICKS DURING THE INTERNATIONAL CONFERENCE METAVERSE-5.0

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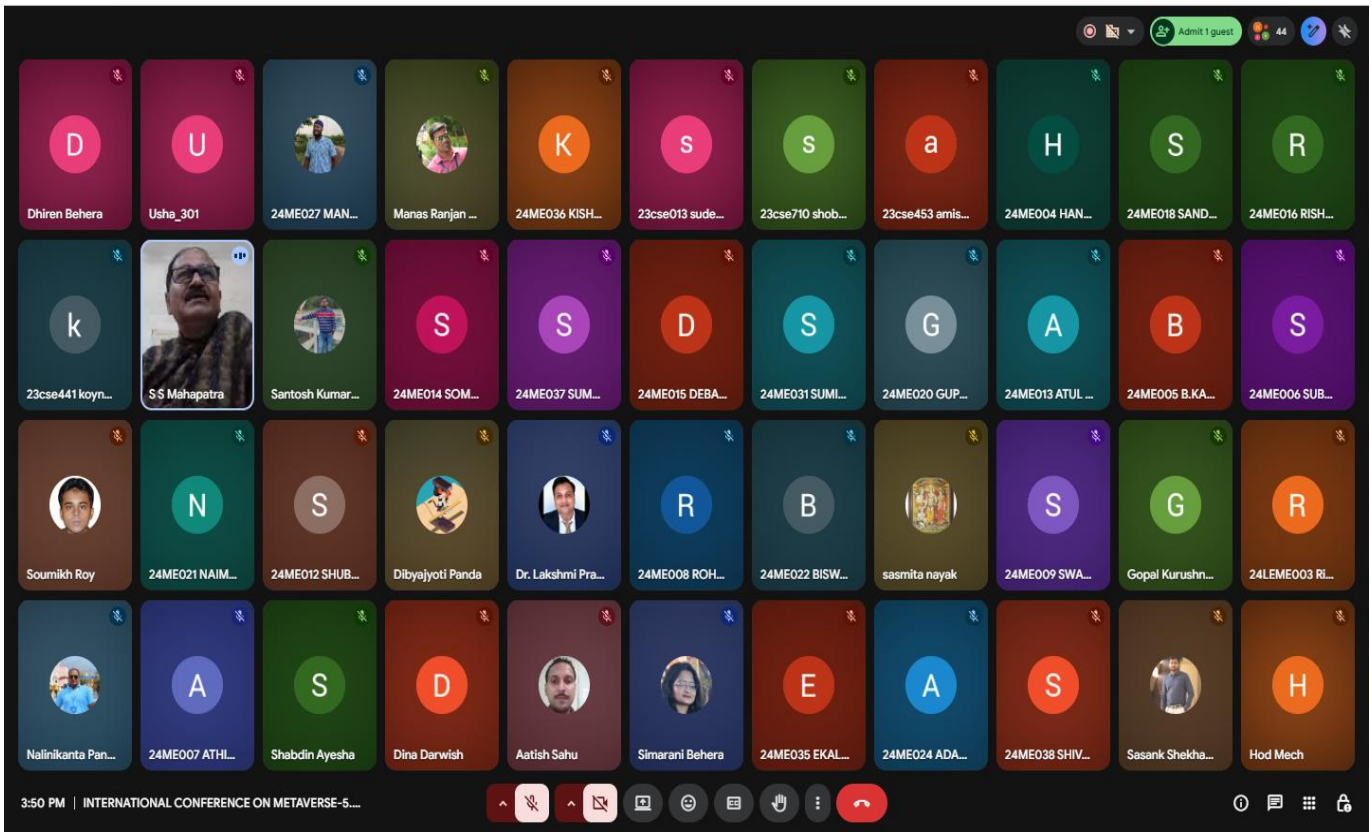
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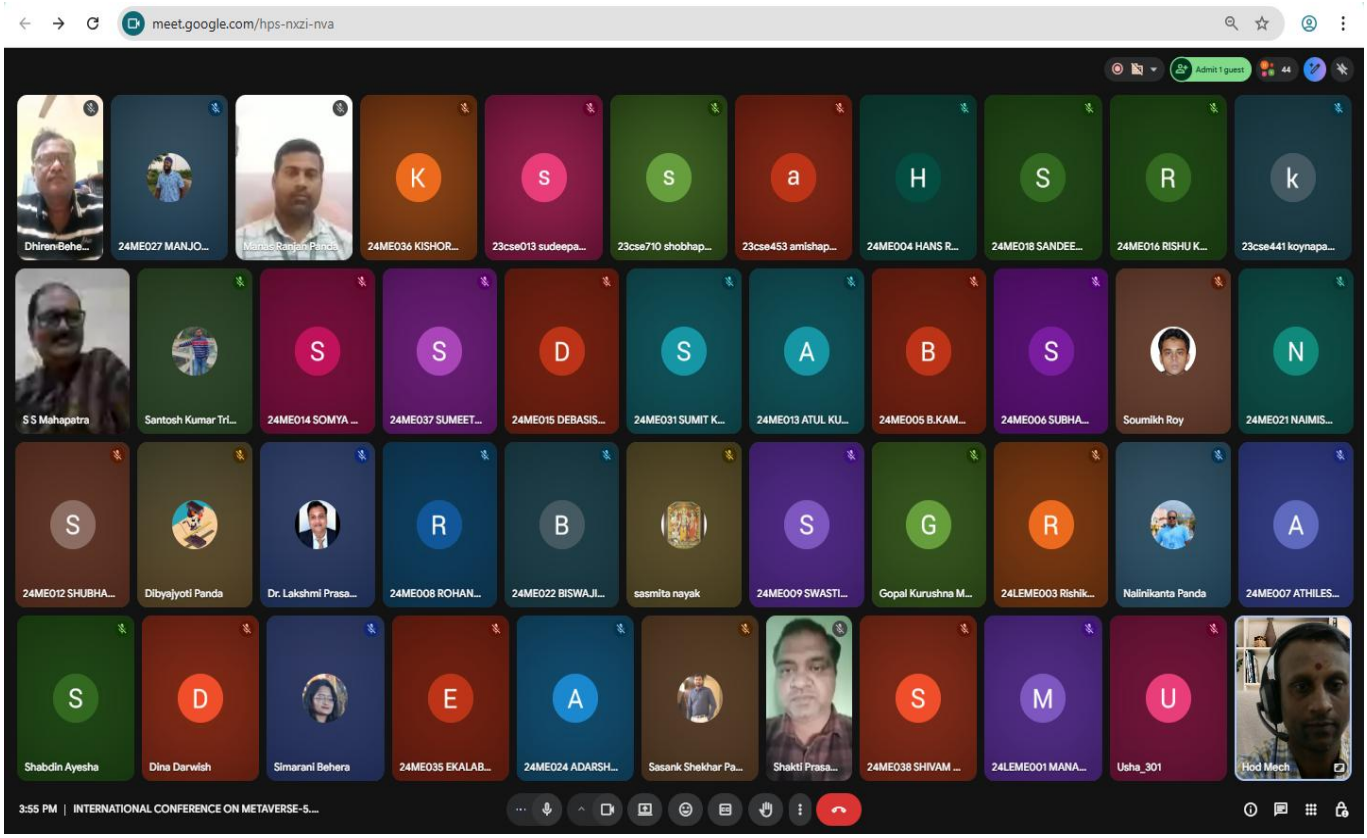
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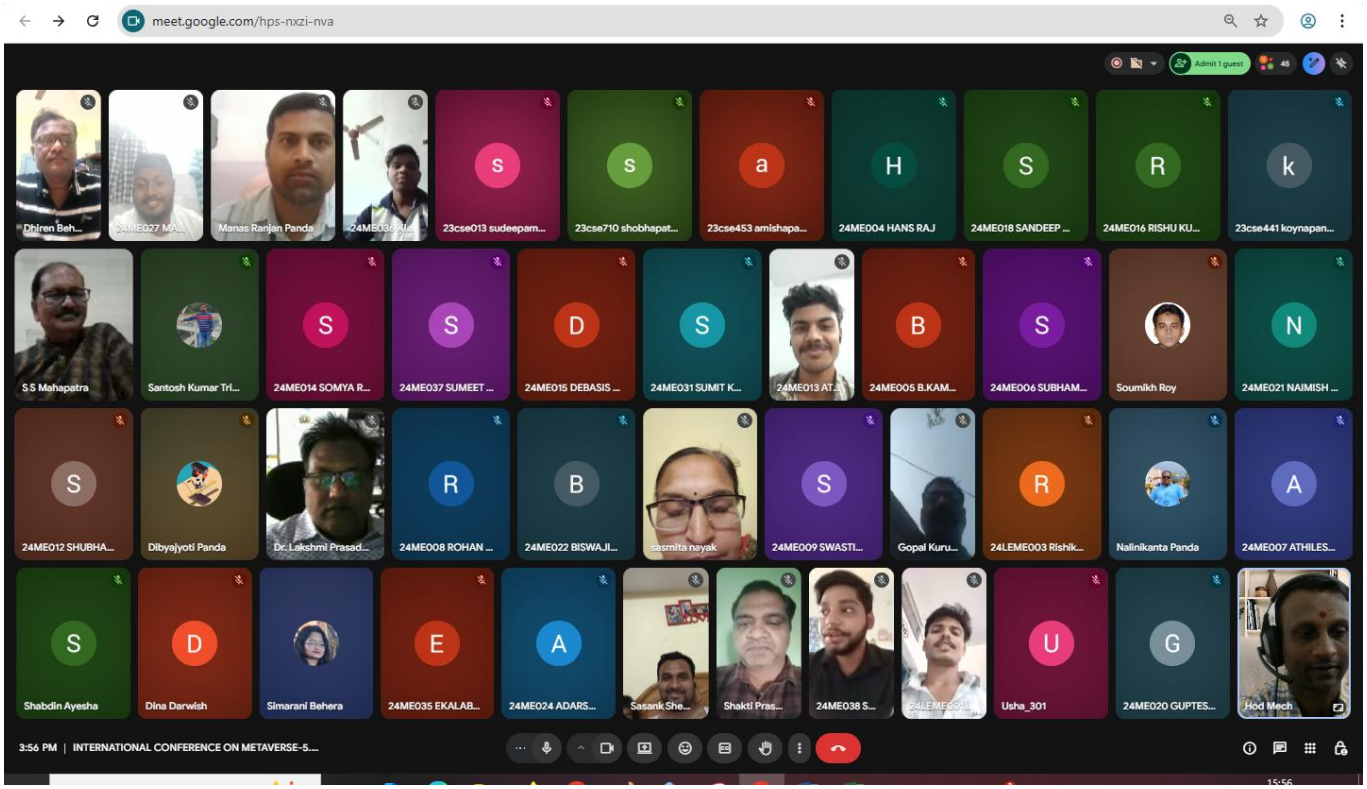
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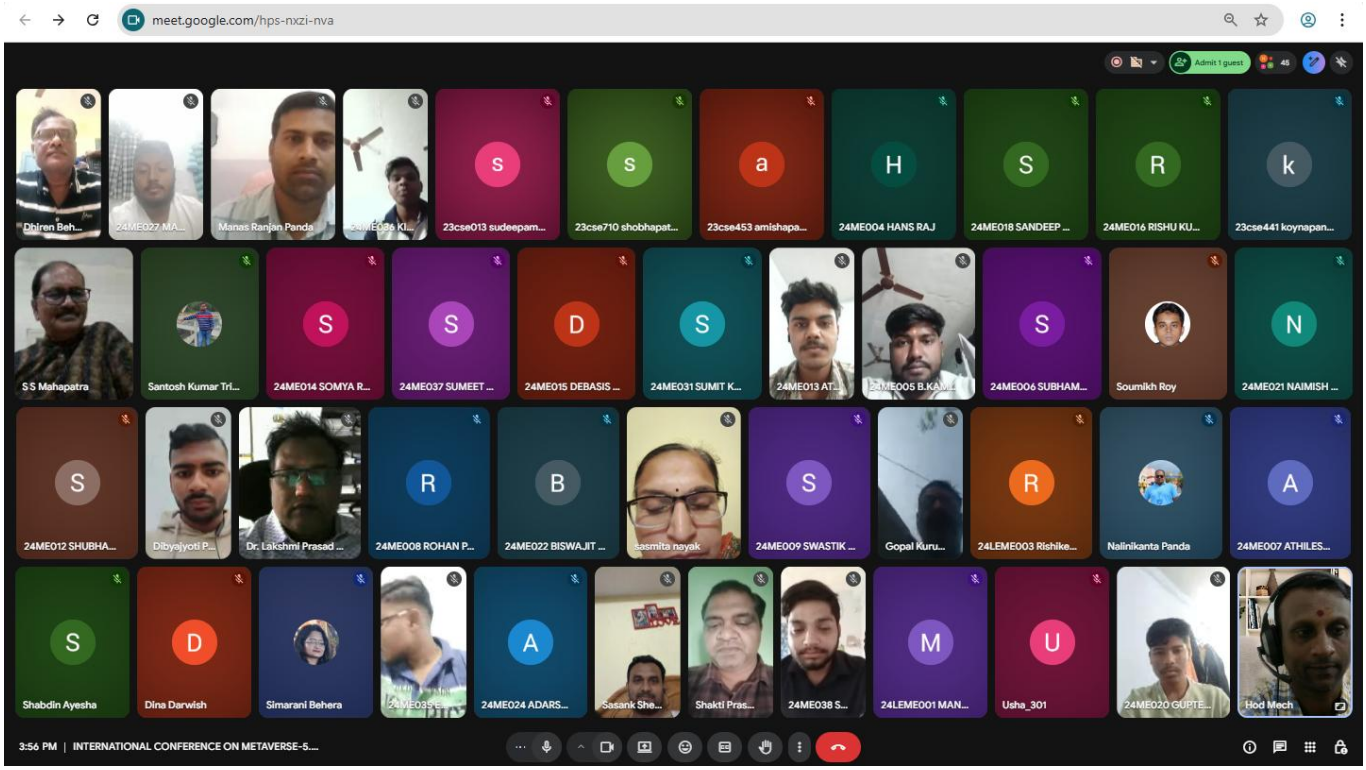
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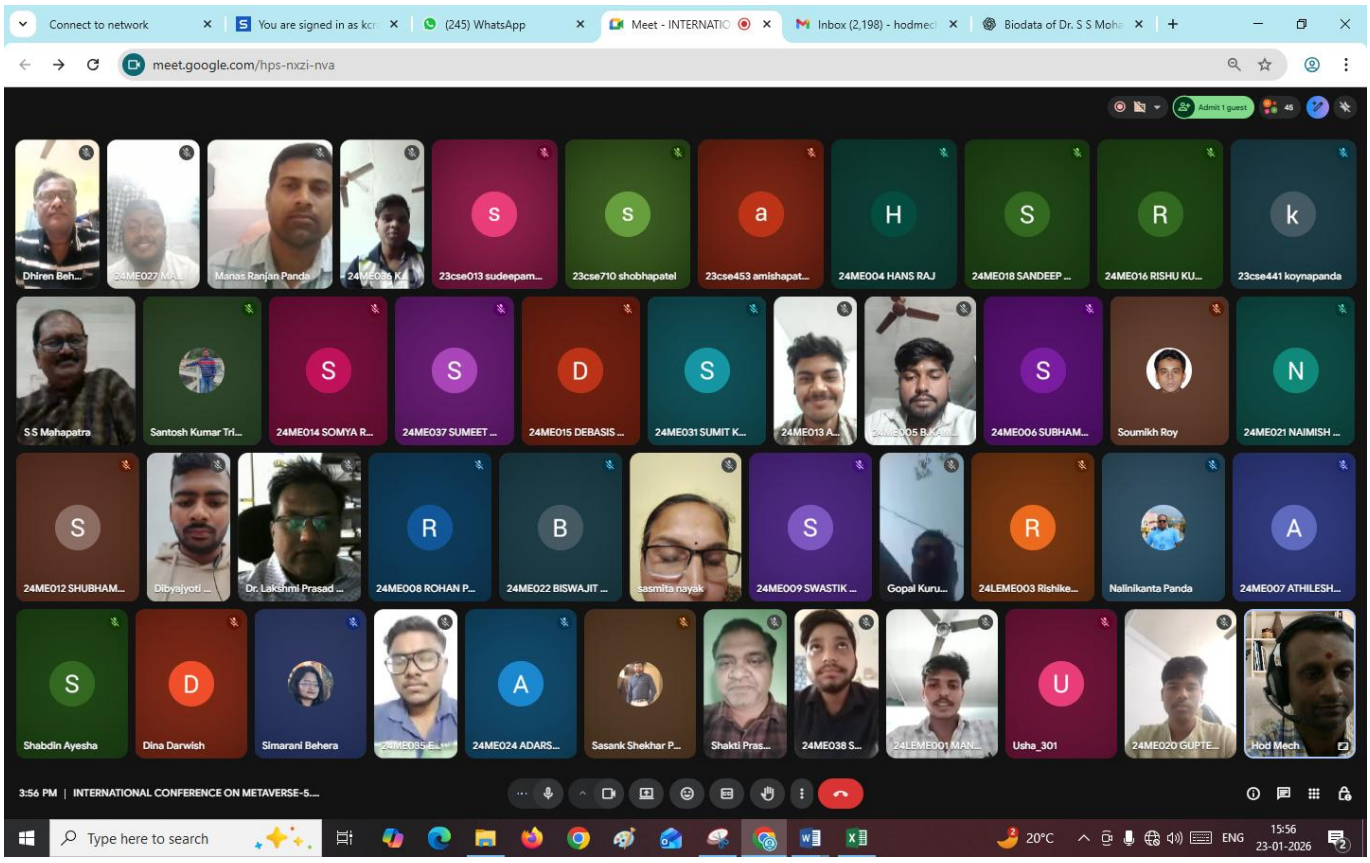
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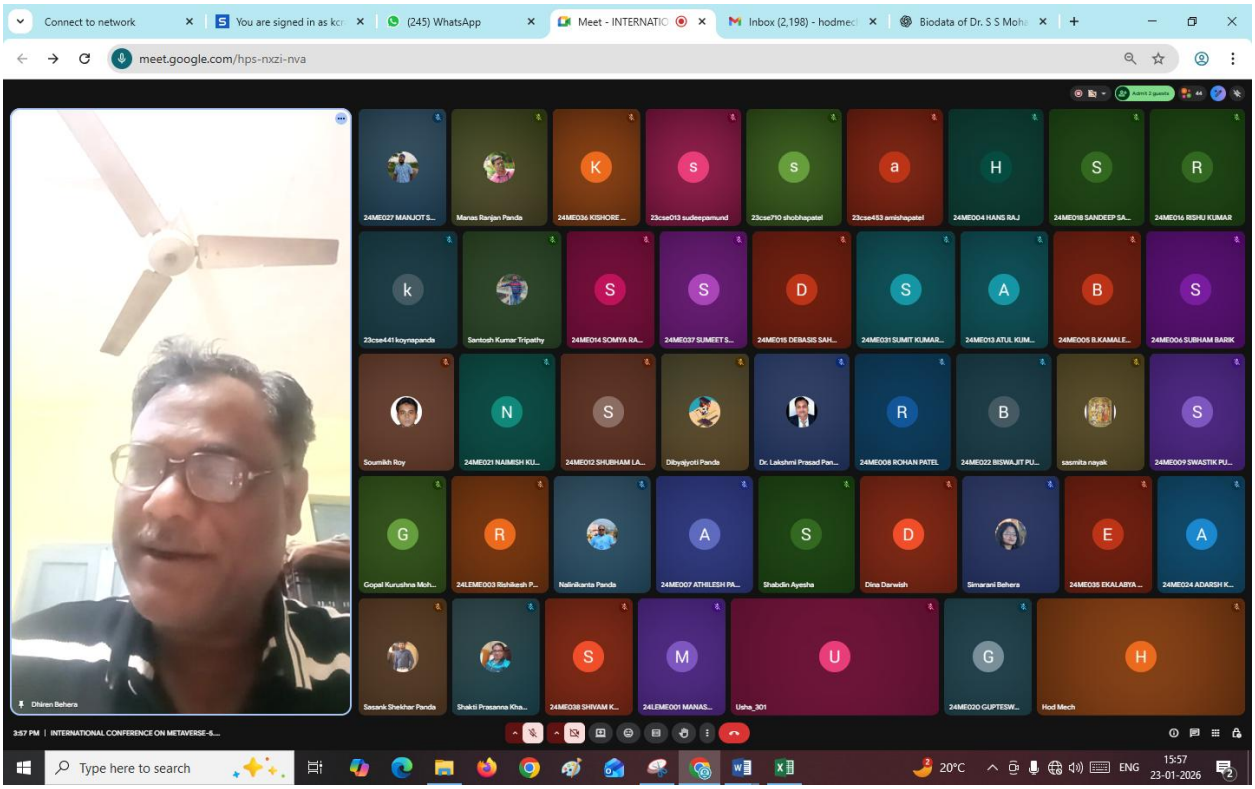
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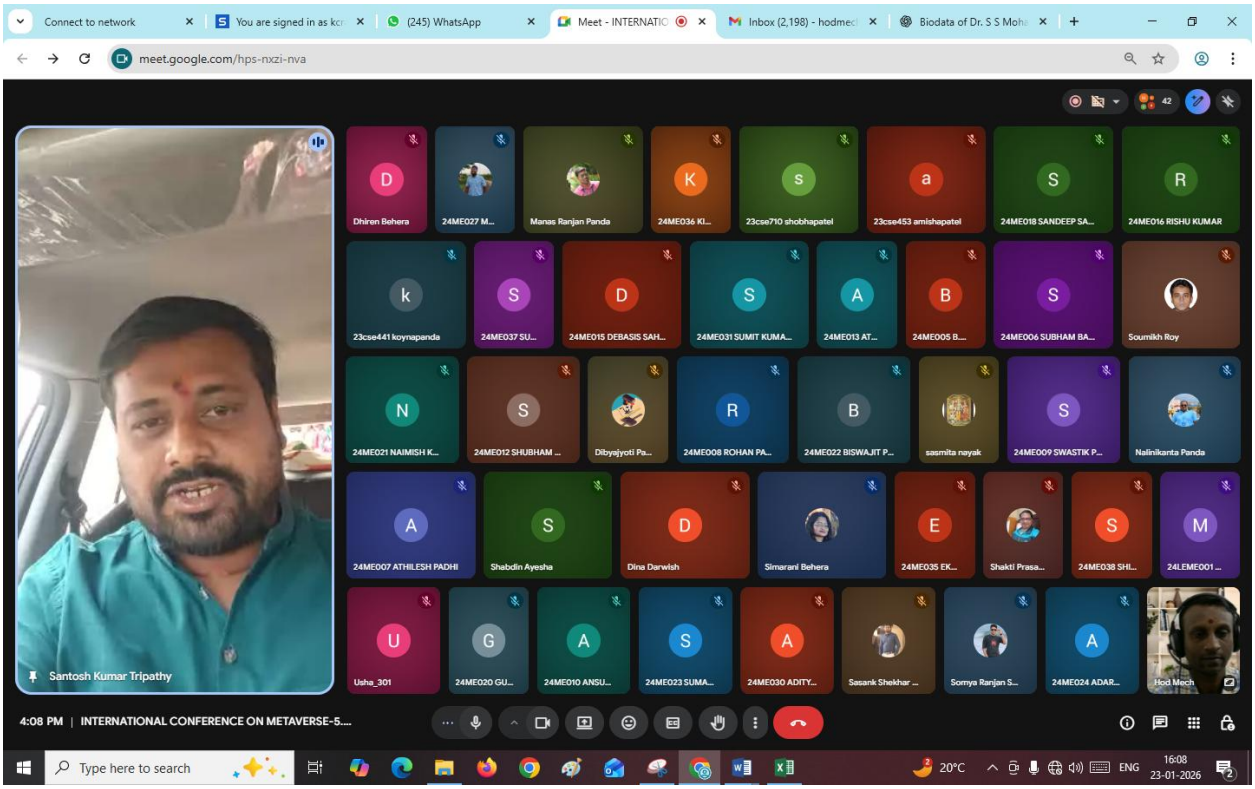
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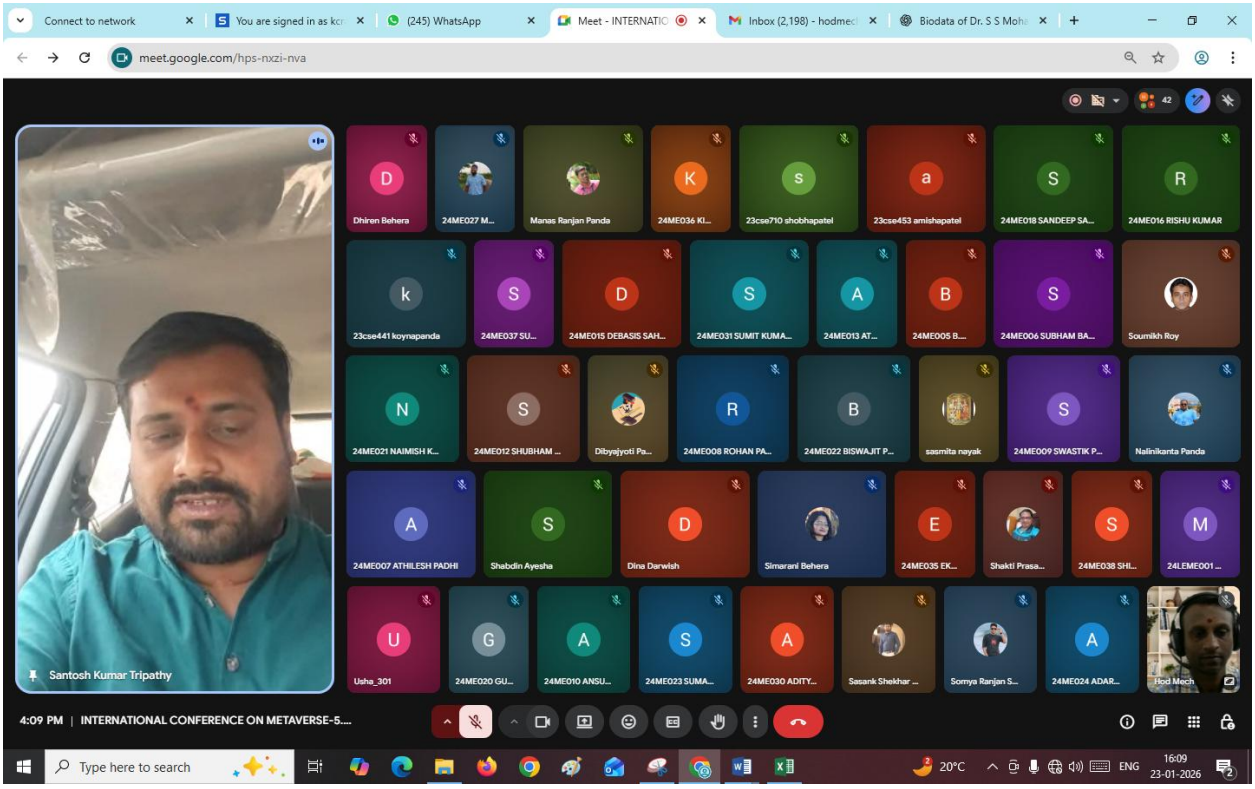
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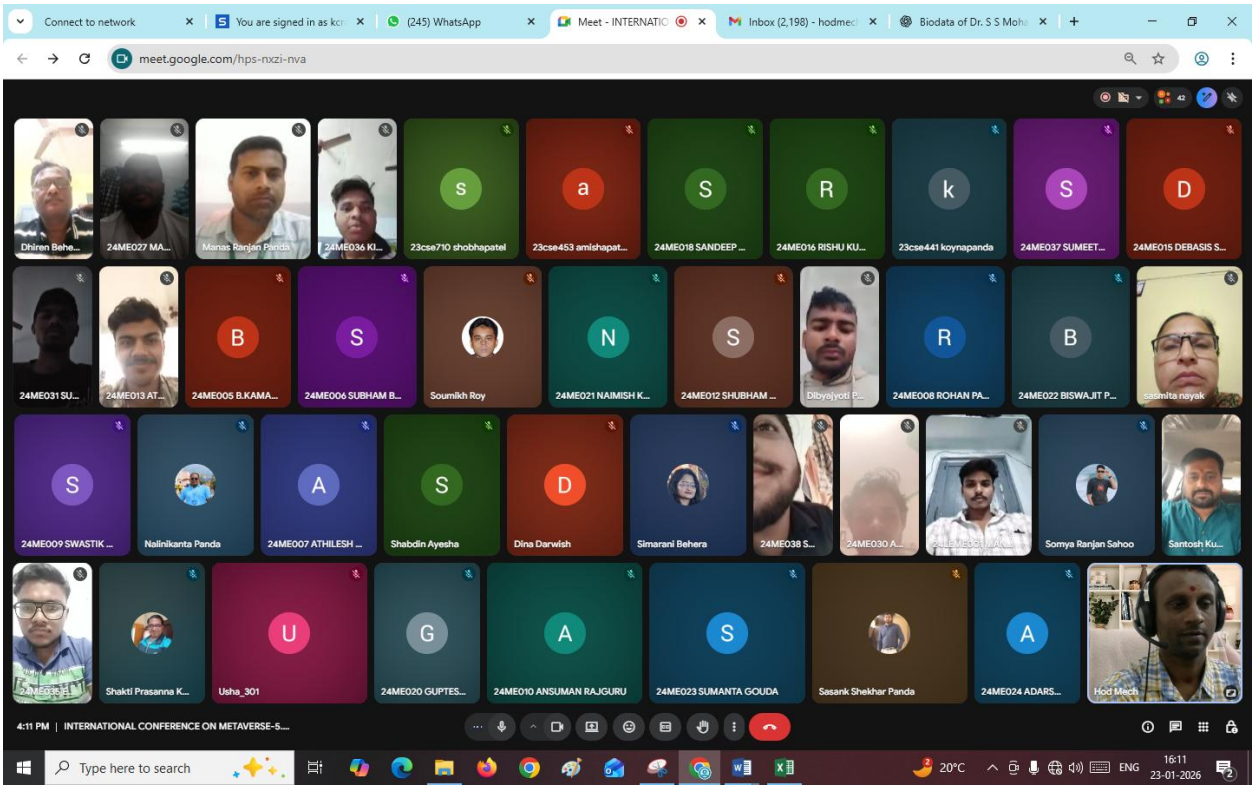
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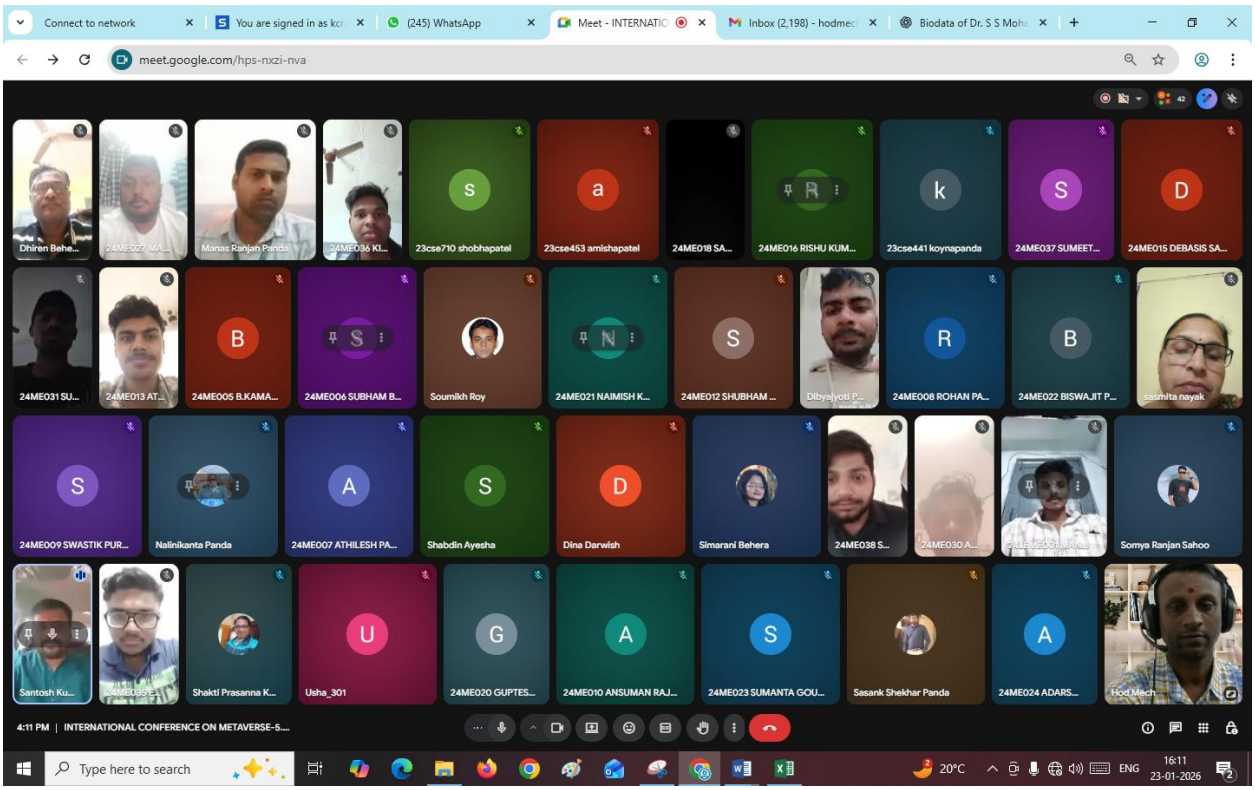
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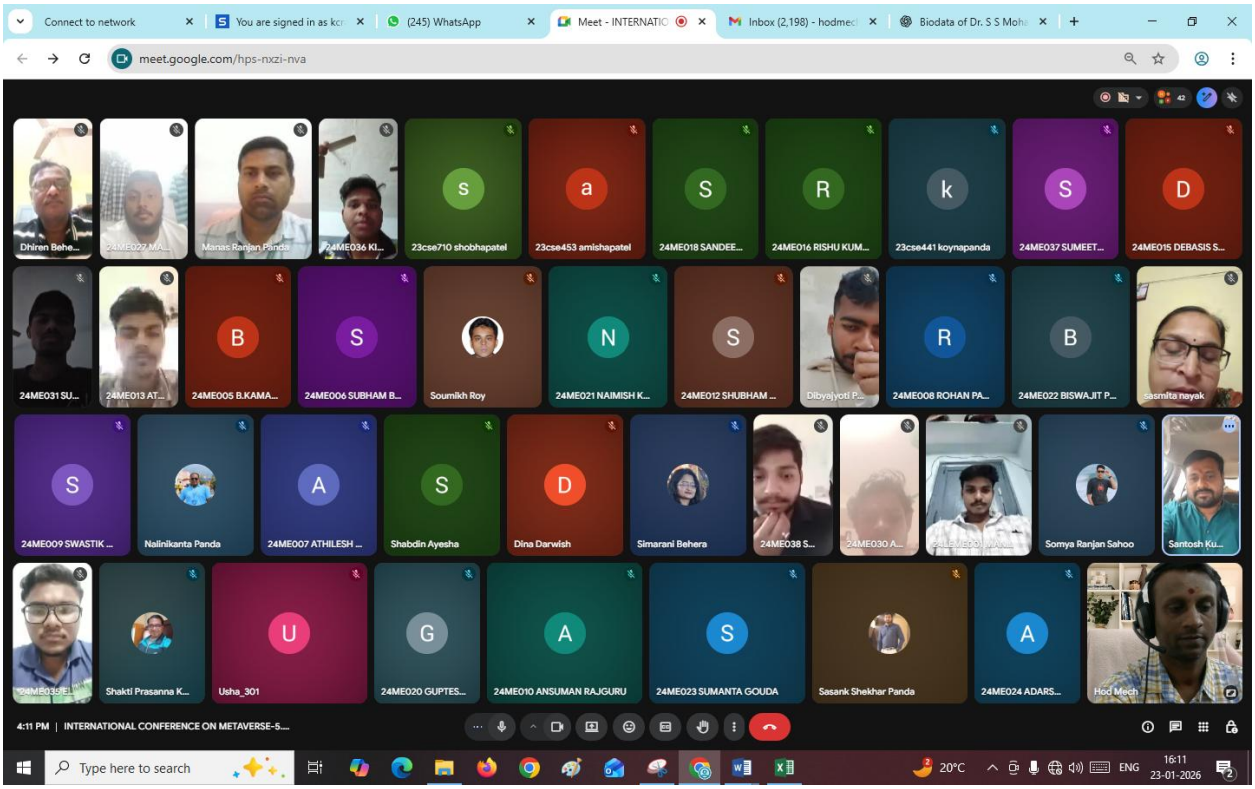
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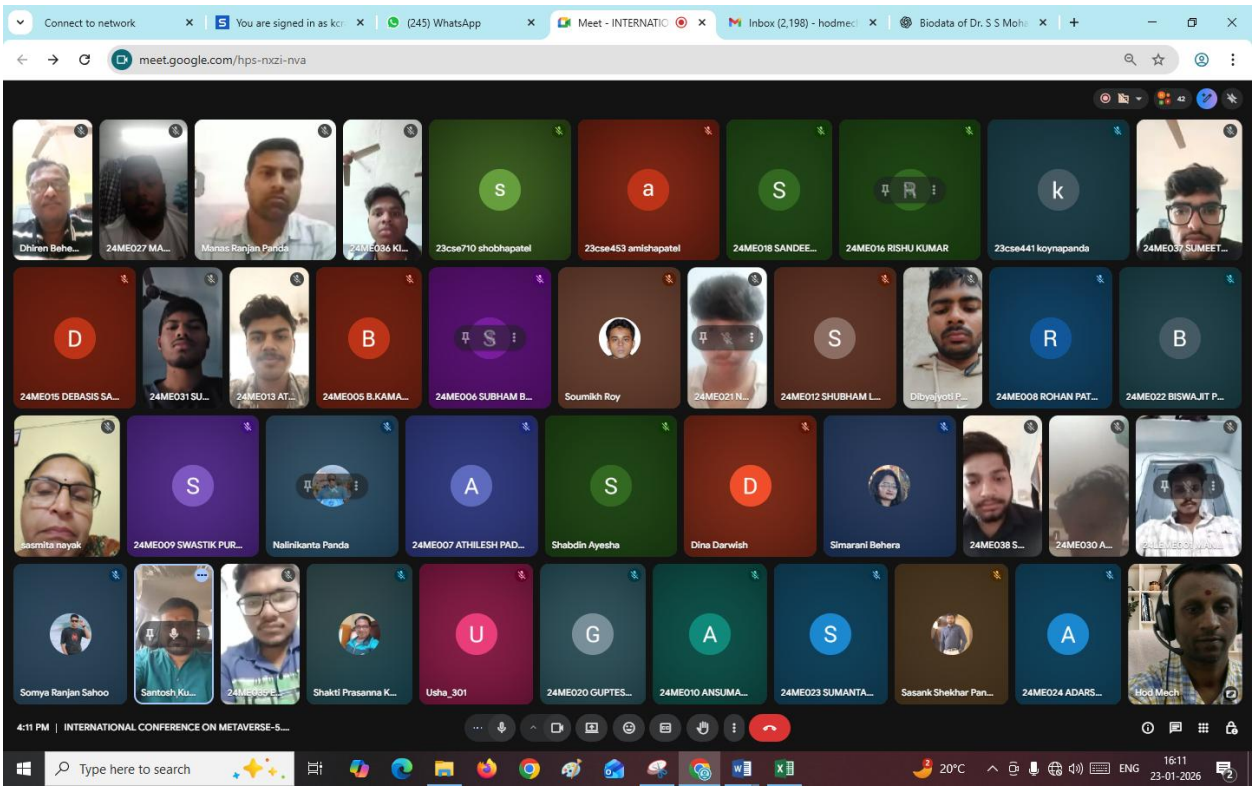
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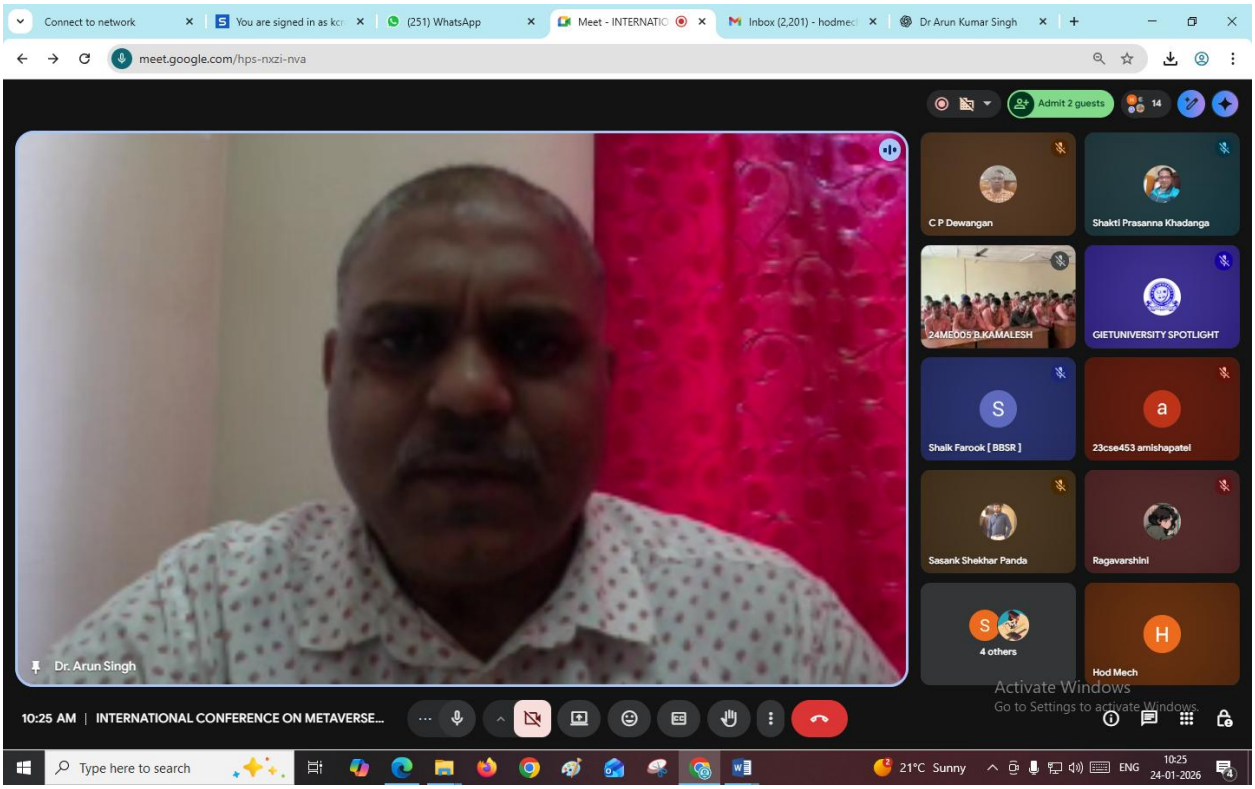
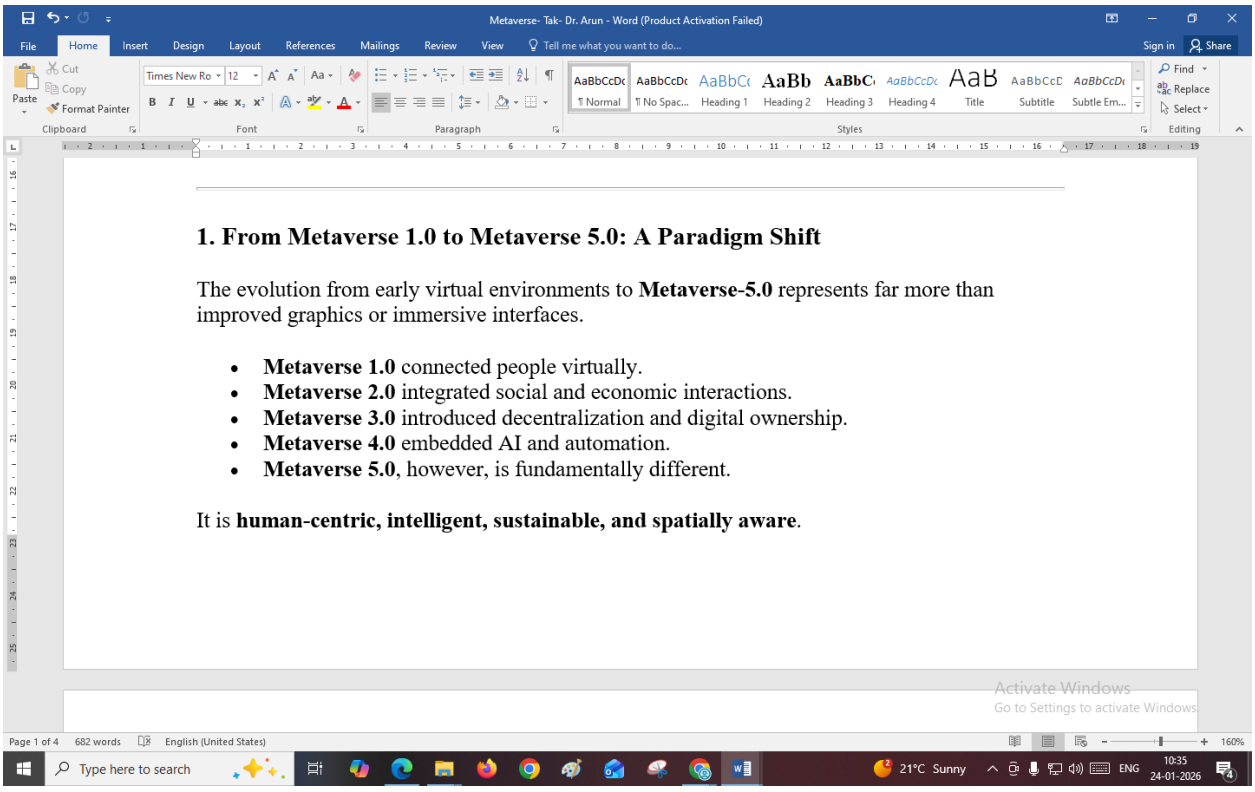
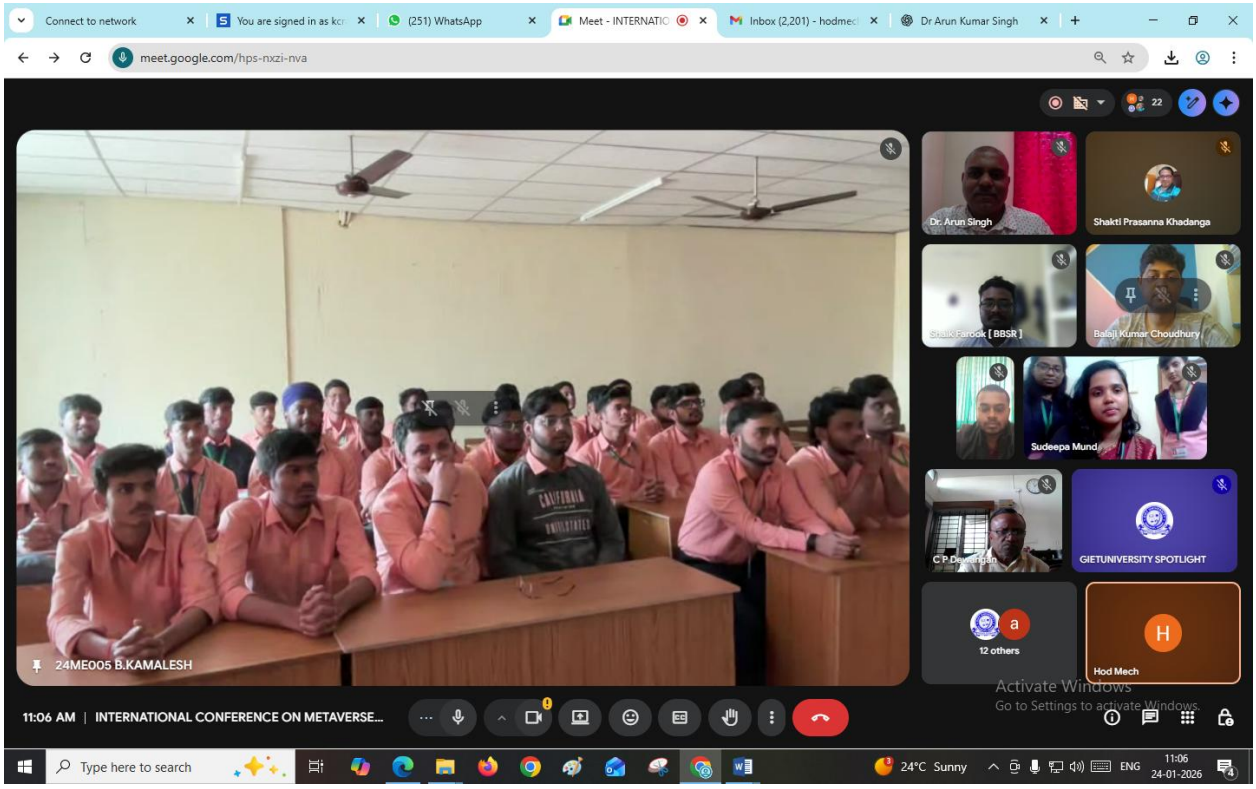
DAY-2 ; DATE : 24.01.2026

KEYNOTE TALK

Dr. Arun Kumar Singh



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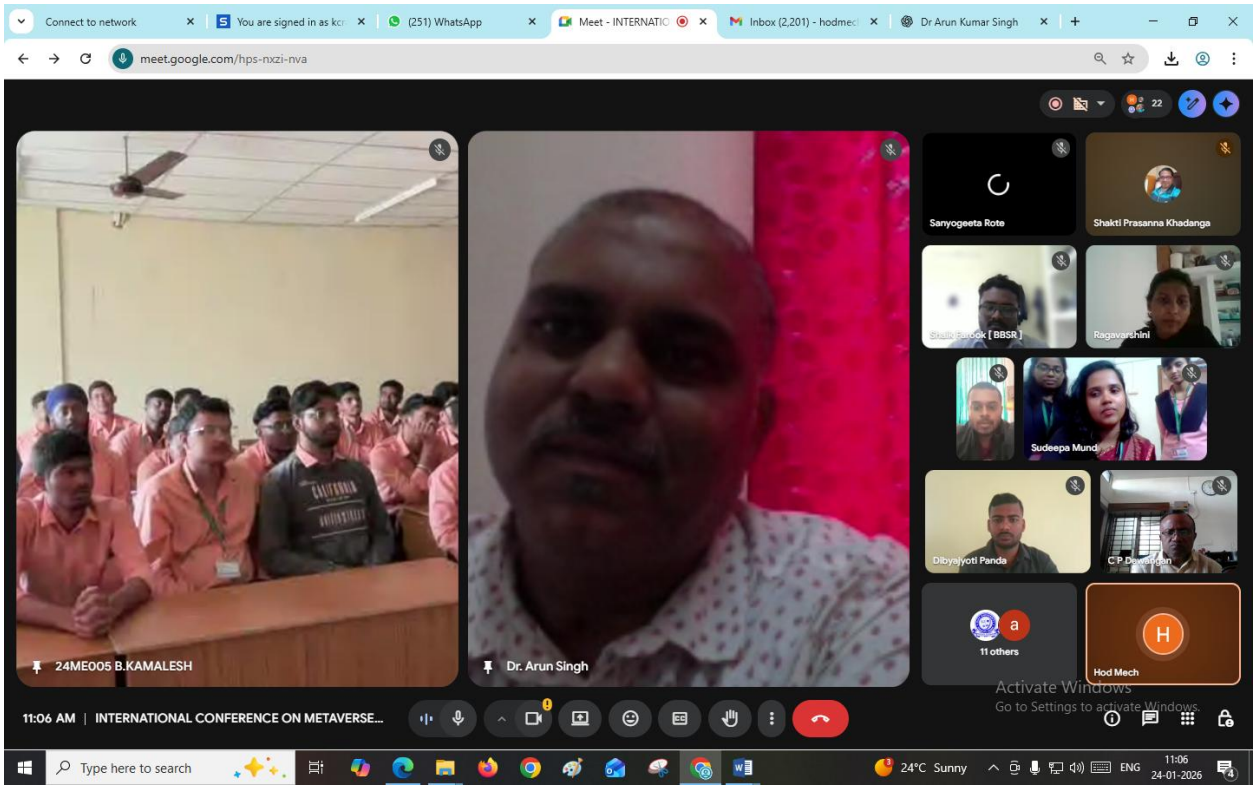
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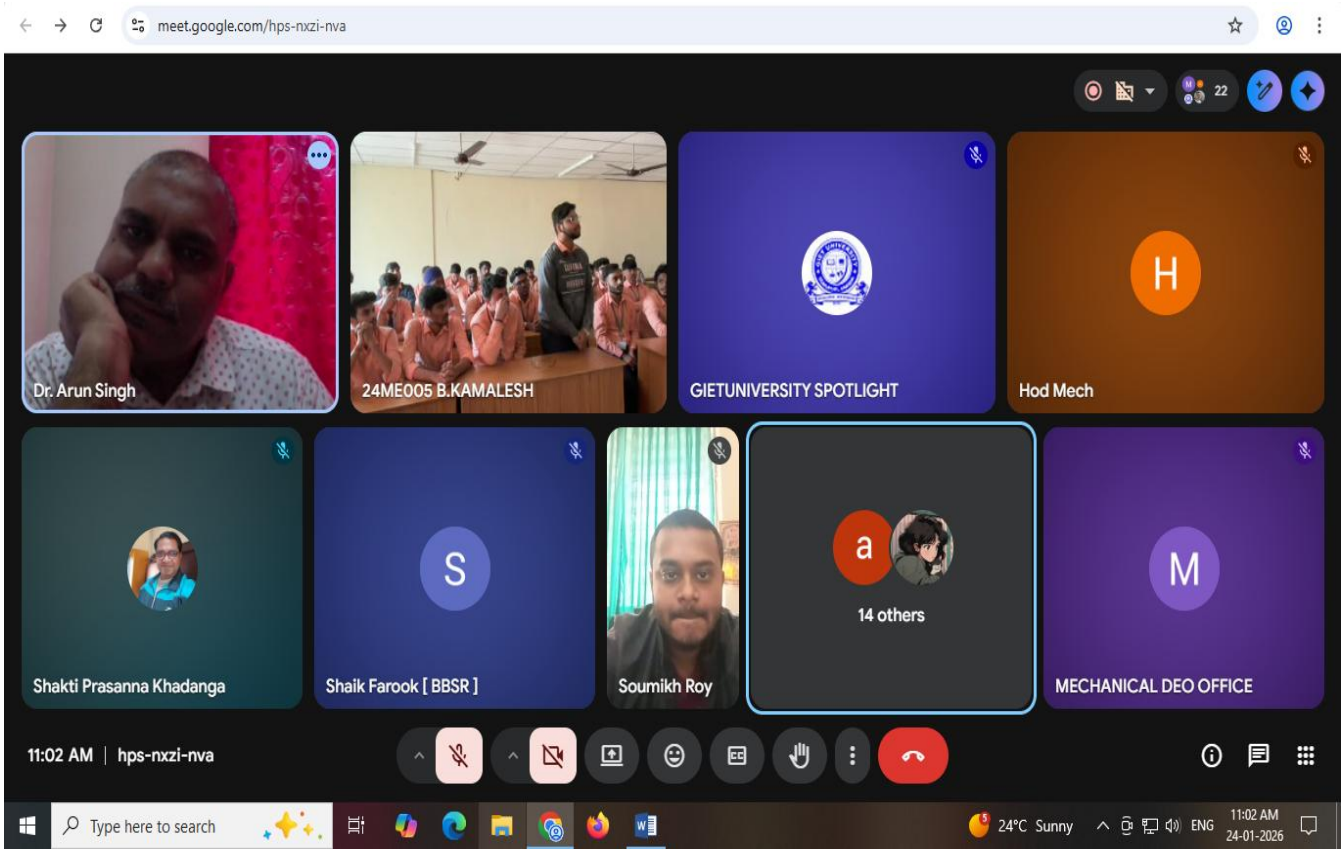
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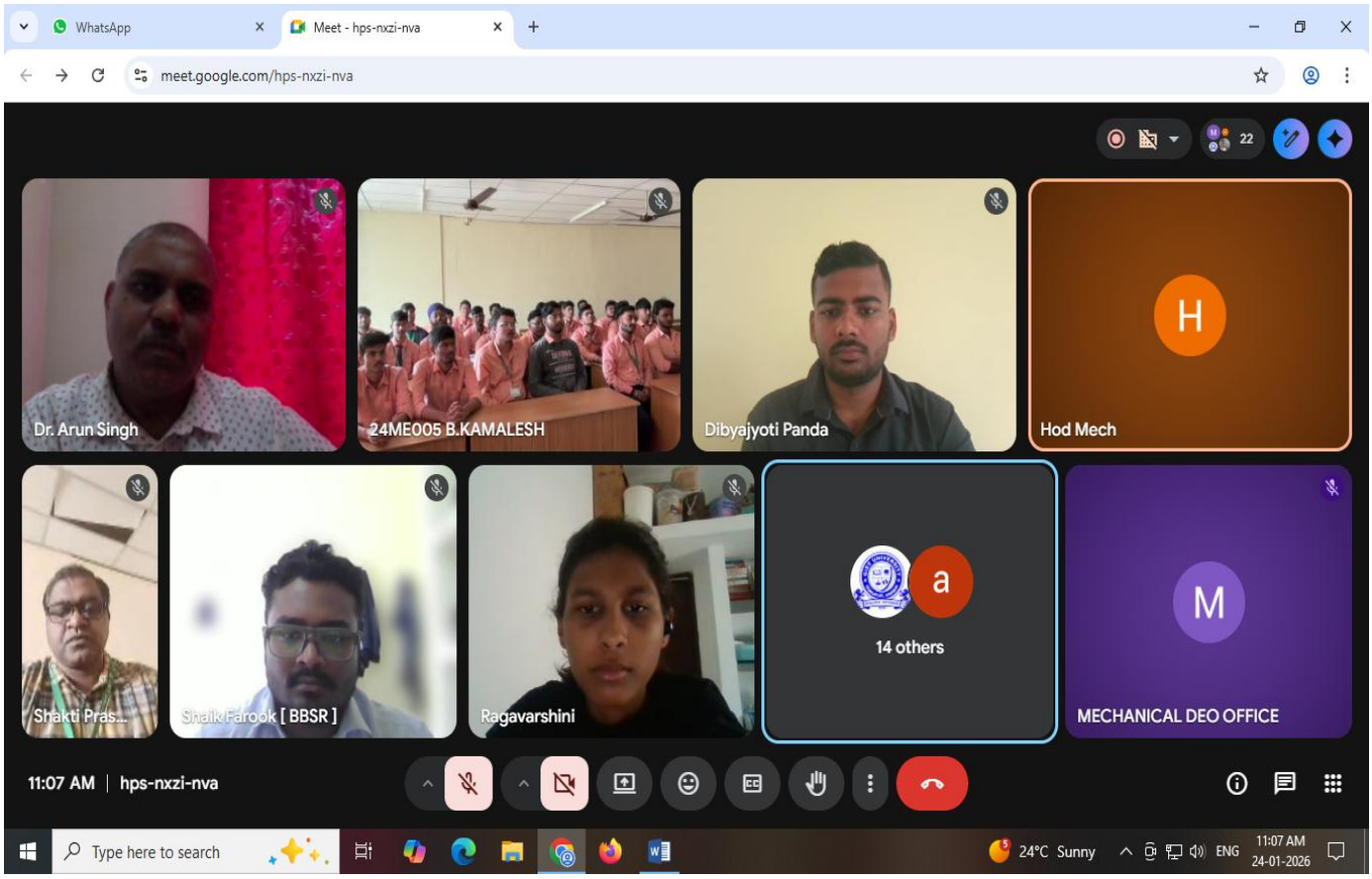
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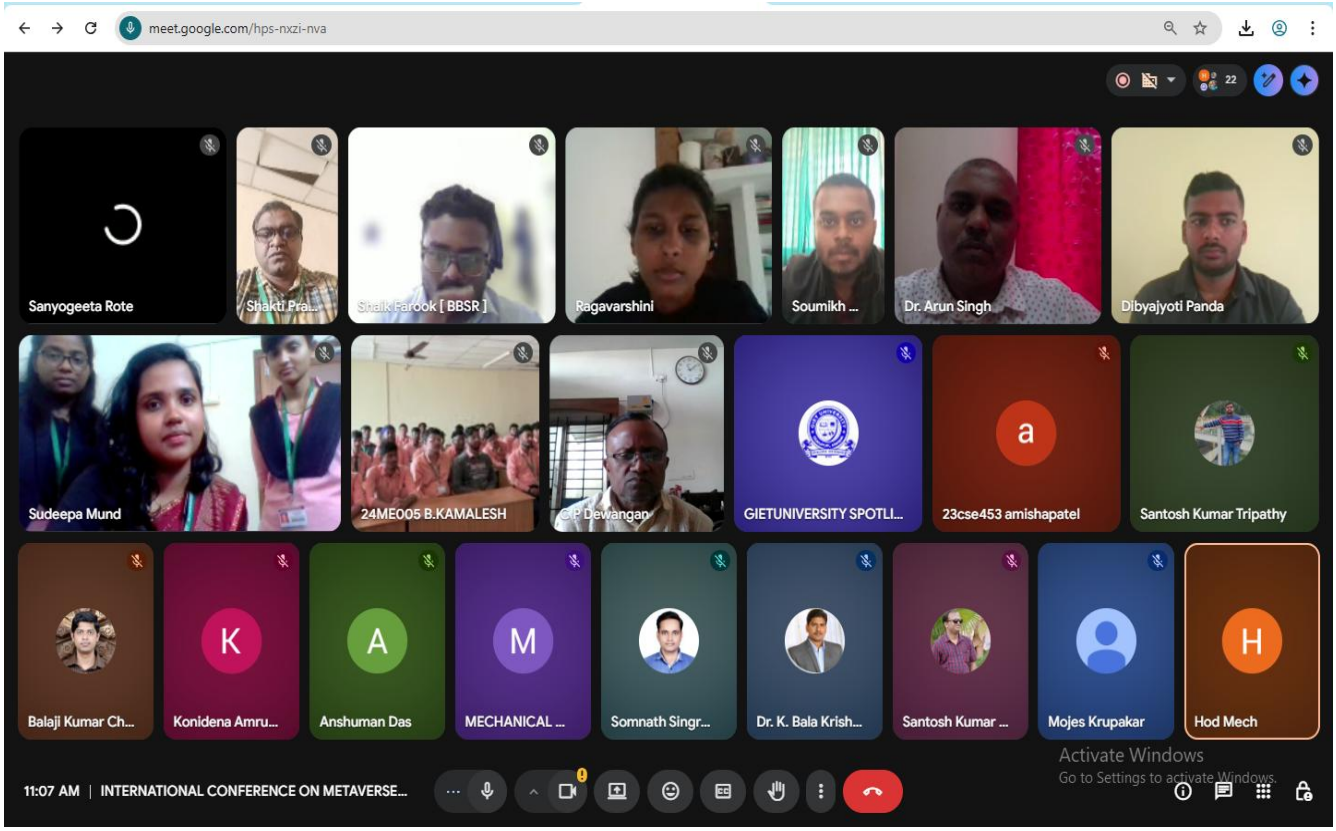
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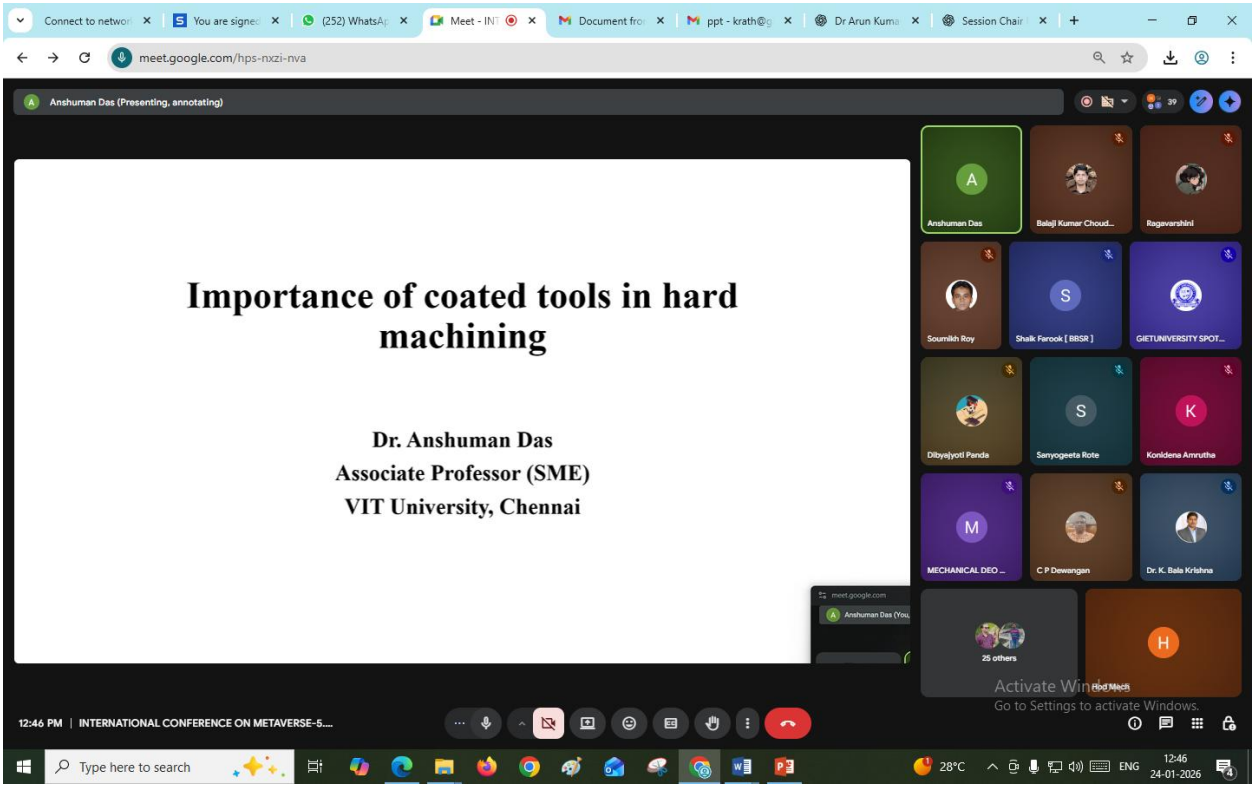
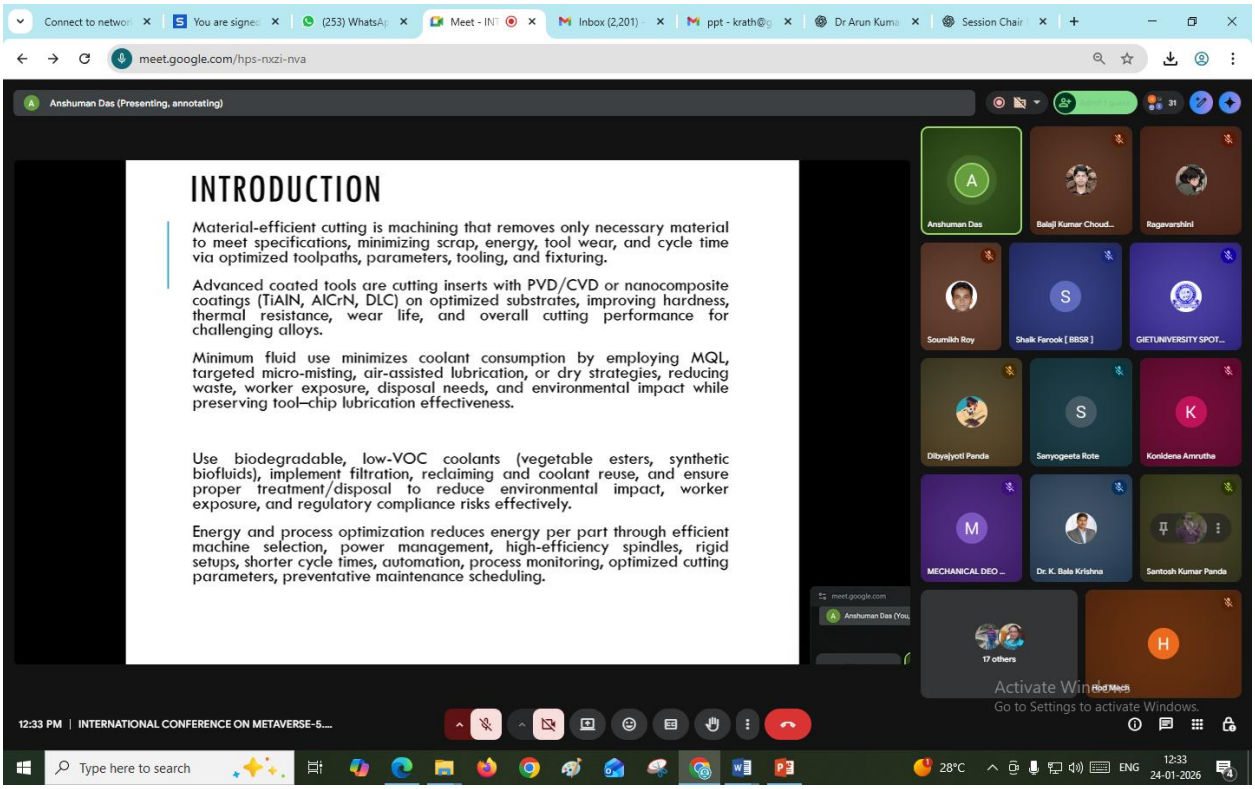
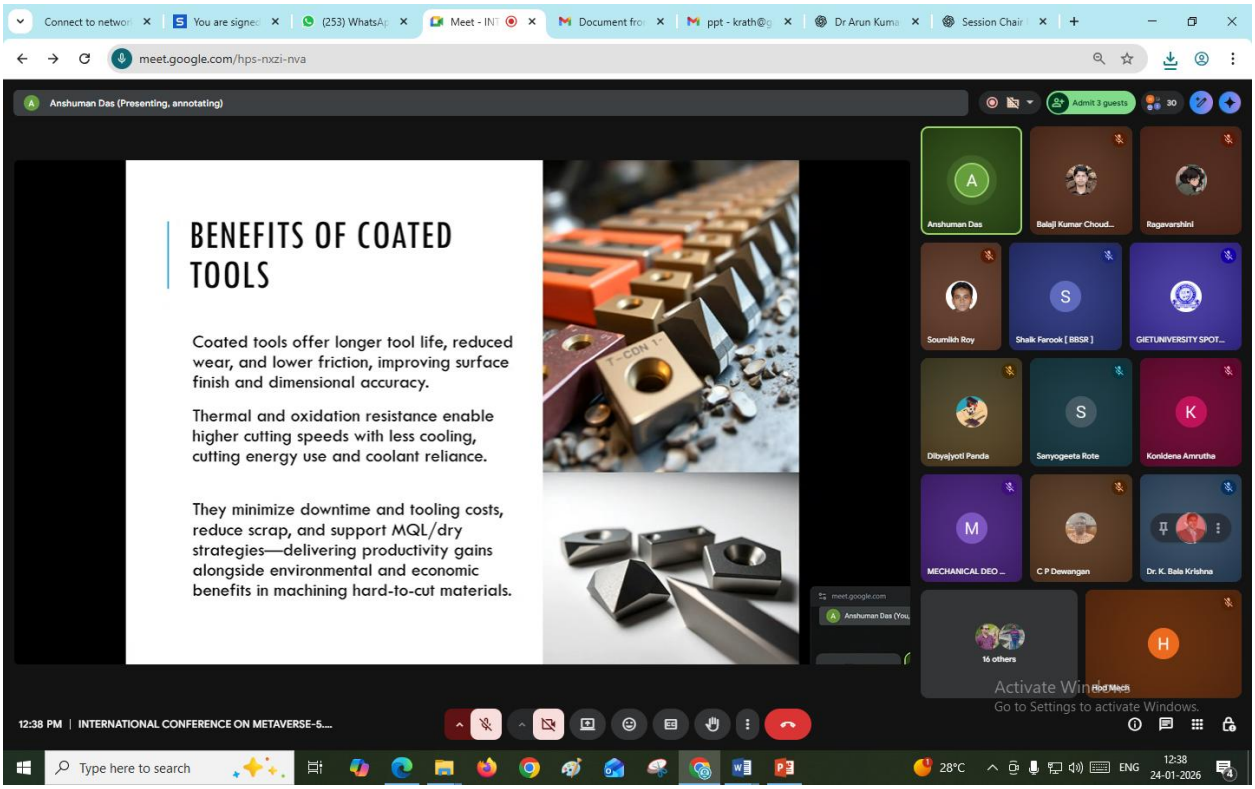
Dr. Anshuman Das



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BENEFITS OF COATED TOOLS
Coated tools offer longer tool life, reduced wear, and lower friction, improving surface finish and dimensional accuracy.
Thermal and oxidation resistance enable higher cutting speeds with less cooling, cutting energy use and coolant reliance.
They minimize downtime and tooling costs, reduce scrap, and support MQL/dry strategies—delivering productivity gains alongside environmental and economic benefits in machining hard-to-cut materials.
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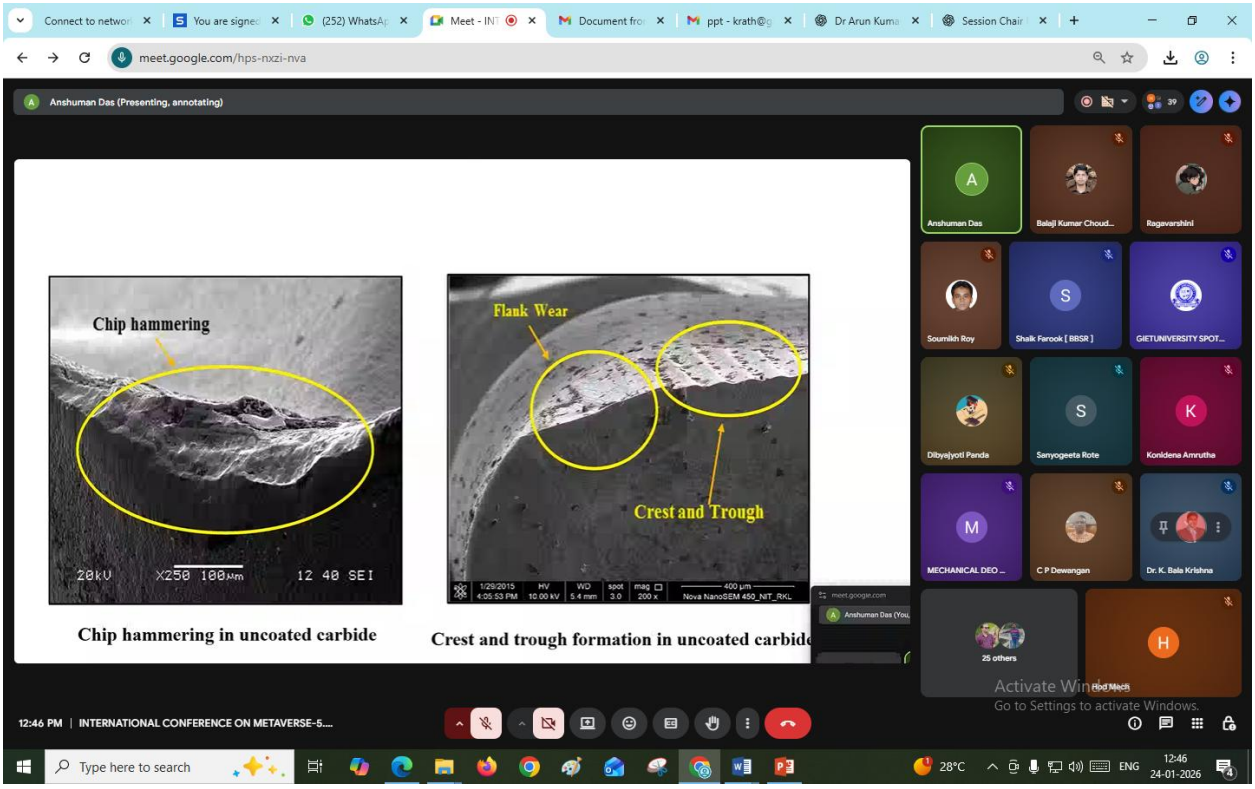
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Chip hammering in uncoated carbide
Flank Wear
Crest and Trough
Crest and trough formation in uncoated carbid
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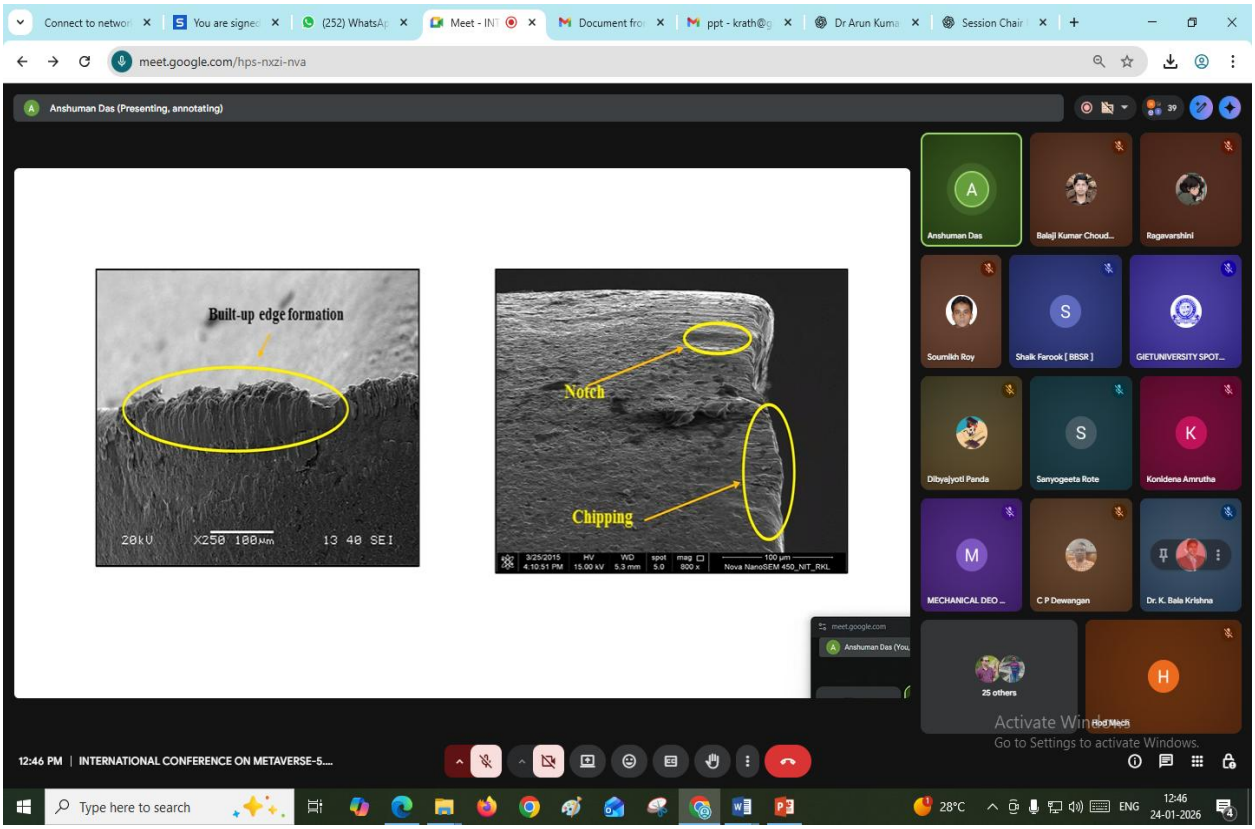


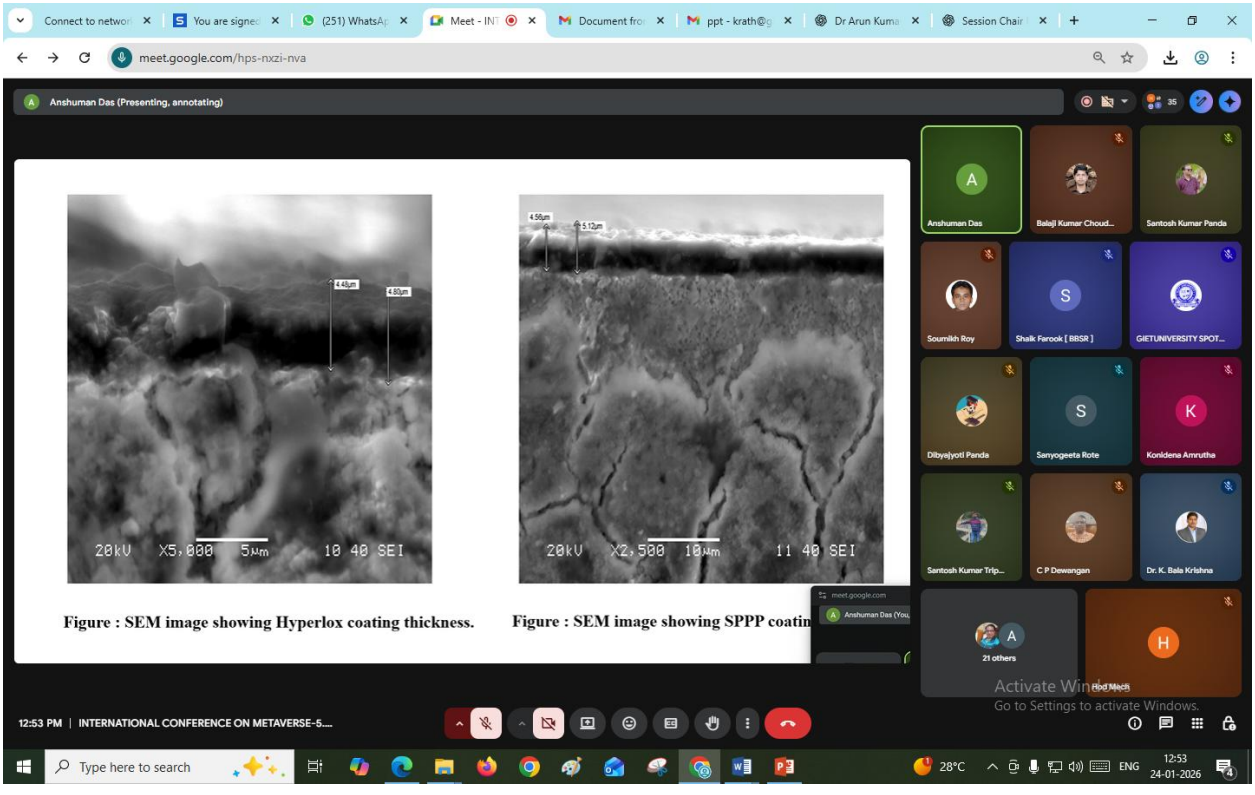
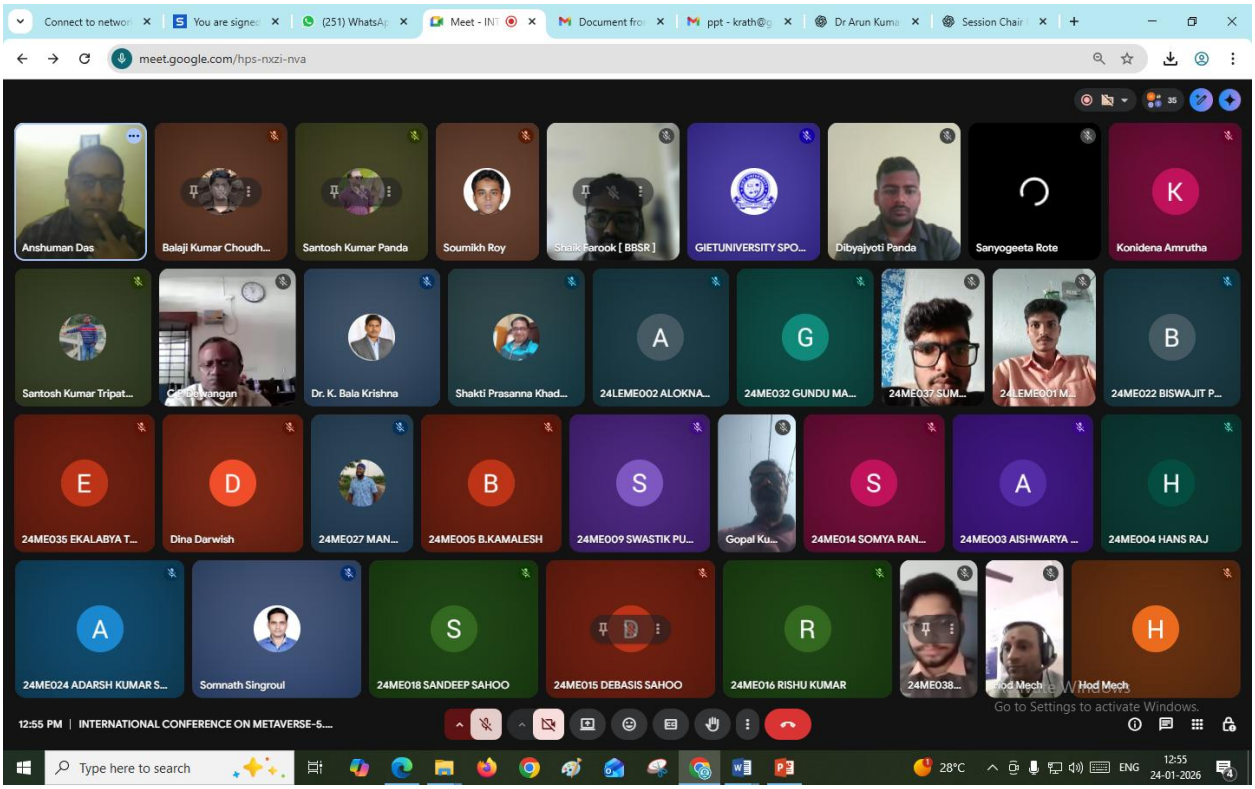


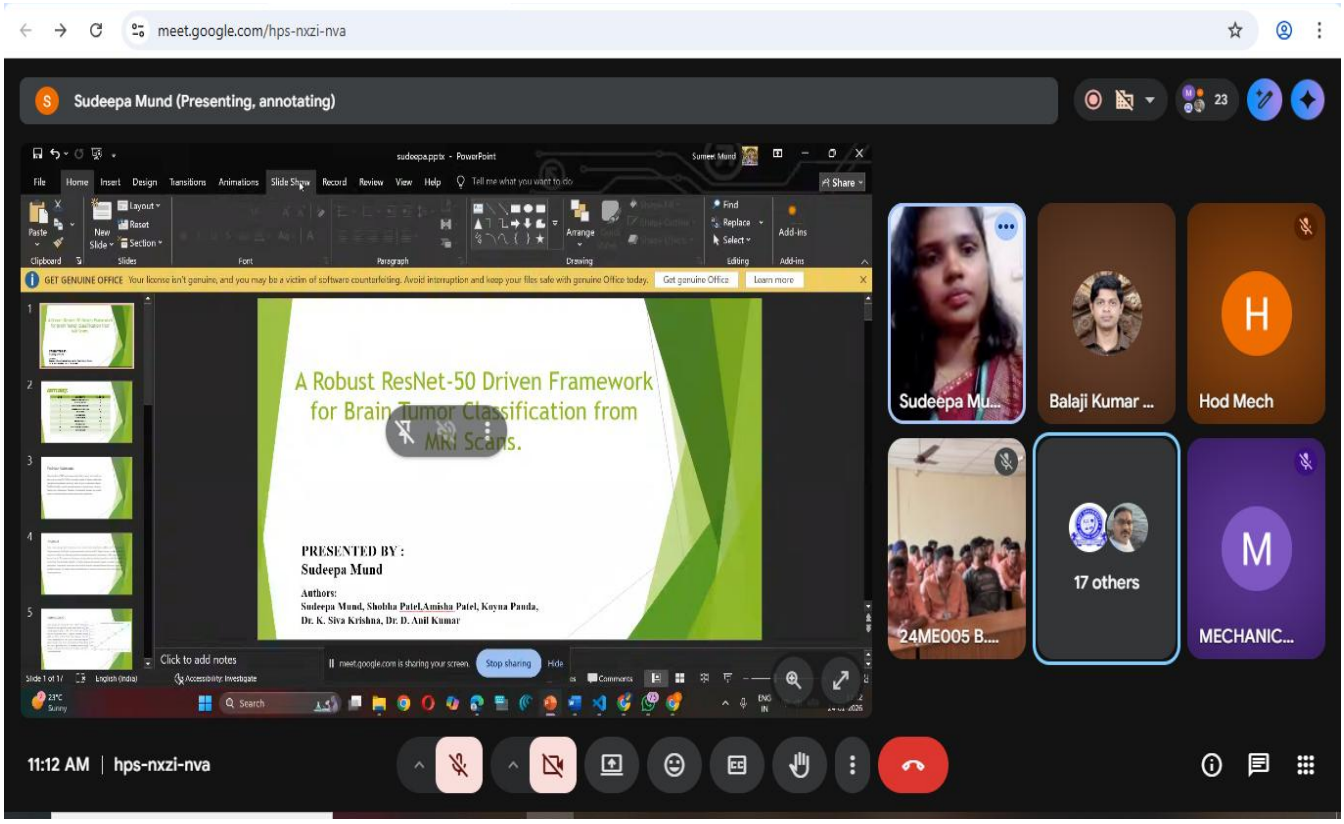
Figure : SEM image showing Hyperlox coating thickness.

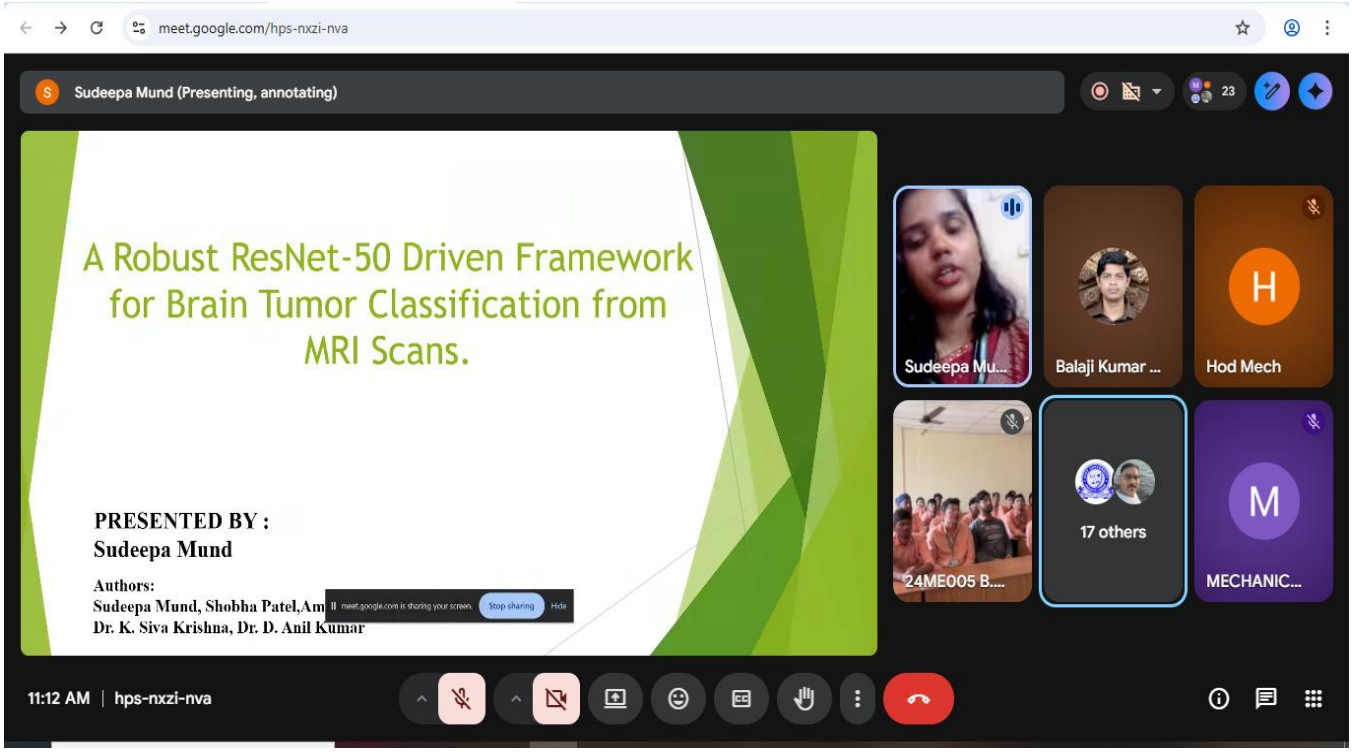
Figure : SEM image showing SPPP coatin

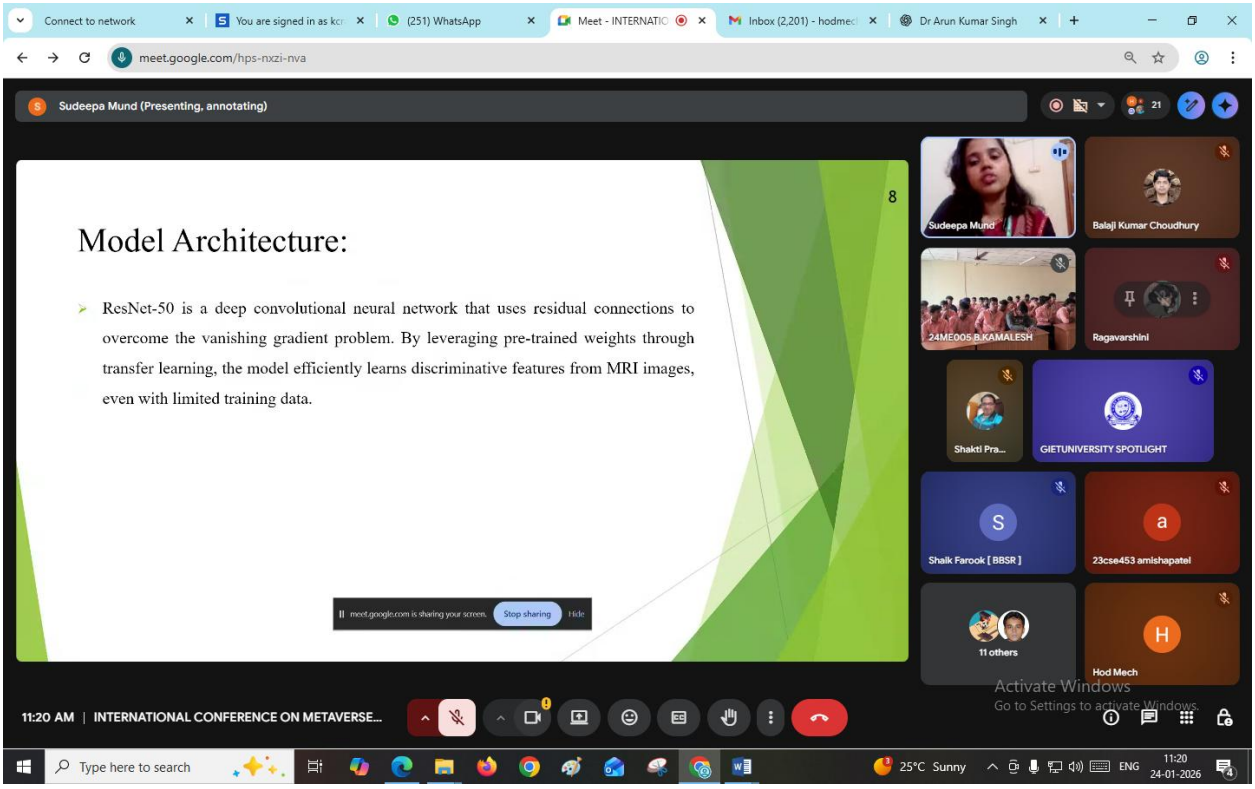


Prof. Dina Darwish

TECHNICAL SESSION






Sudeepa Mund (Presenting, annotating)
8
Model Architecture:
ResNet-50 is a deep convolutional neural network that uses residual connections to overcome the vanishing gradient problem. By leveraging pre-trained weights through transfer learning, the model efficiently learns discriminative features from MRI images, even with limited training data.
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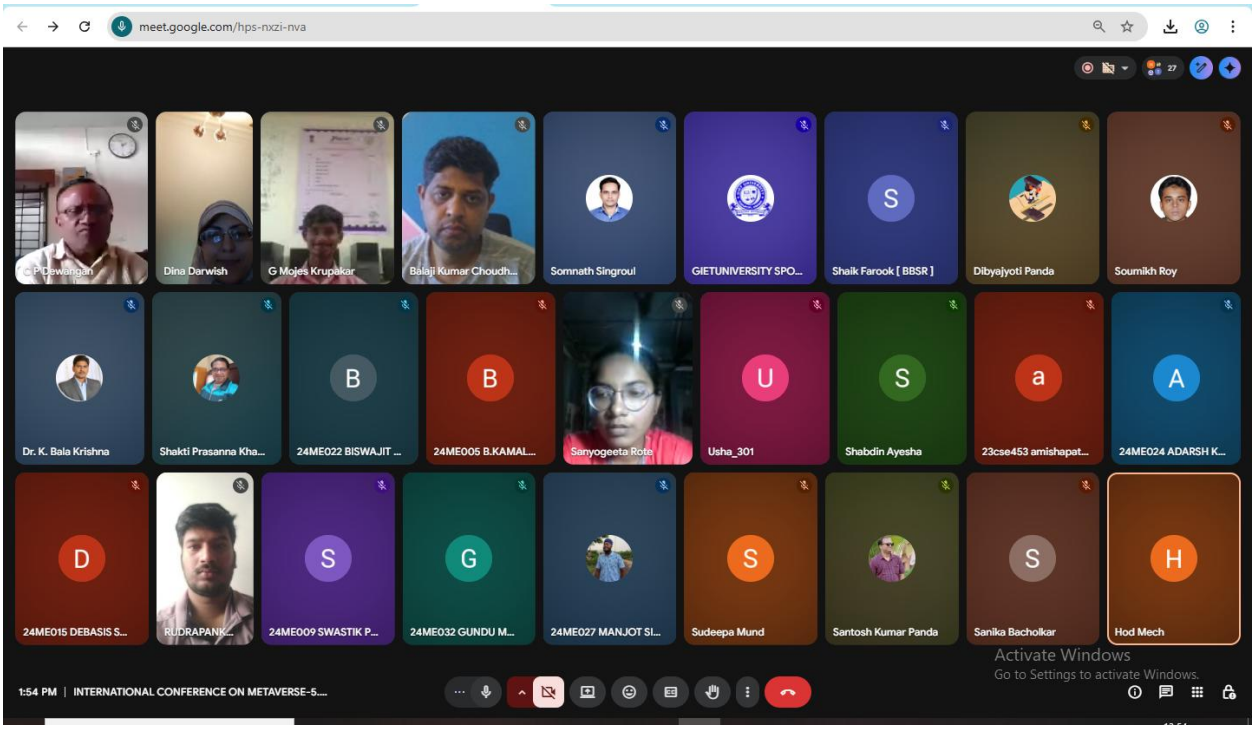
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Thermodynamic Performance analysis of ICE plant on the variation of component temperature

Presented By
Mr. Shaik Farook
Dr. Santosh Kumar Panda
Dr. Balaji Kumar Choudhury
Dr. Kali Charan Rath

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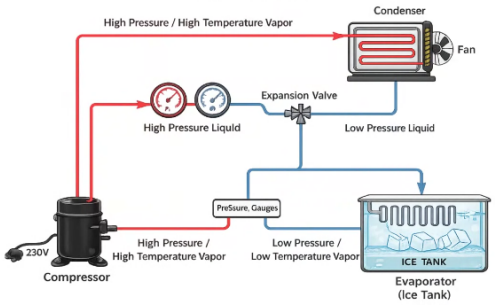
EXPERIMENTAL SETUP

Ice Plant VCR System



Main components: Compressor, Condenser, Expansion valve, Ice tank

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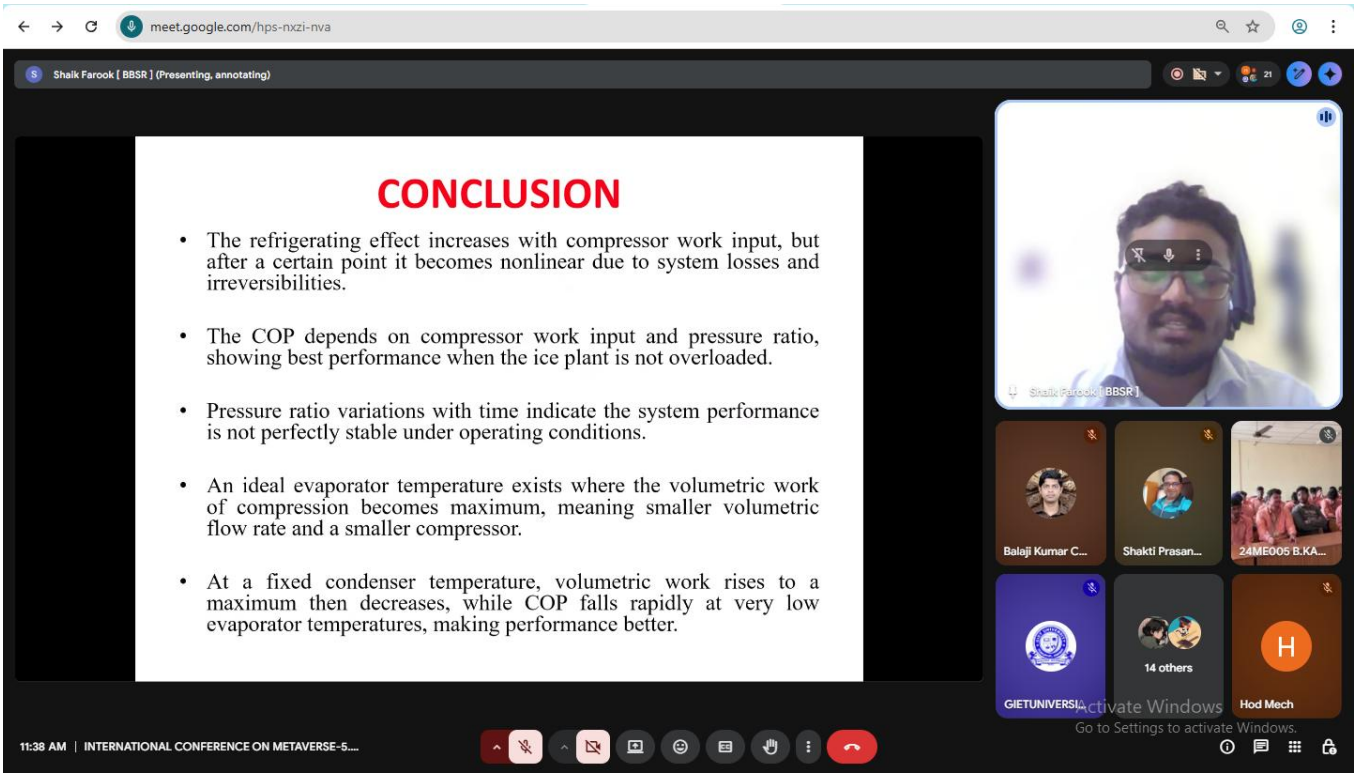
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Shaik Farook [BBSR] (Presenting, annotating)
CONCLUSION
• The refrigerating effect increases with compressor work input, but after a certain point it becomes nonlinear due to system losses and irreversibilities.
• The COP depends on compressor work input and pressure ratio, showing best performance when the ice plant is not overloaded.
• Pressure ratio variations with time indicate the system performance is not perfectly stable under operating conditions.
• An ideal evaporator temperature exists where the volumetric work of compression becomes maximum, meaning smaller volumetric flow rate and a smaller compressor.
• At a fixed condenser temperature, volumetric work rises to a maximum then decreases, while COP falls rapidly at very low evaporator temperatures, making performance better.
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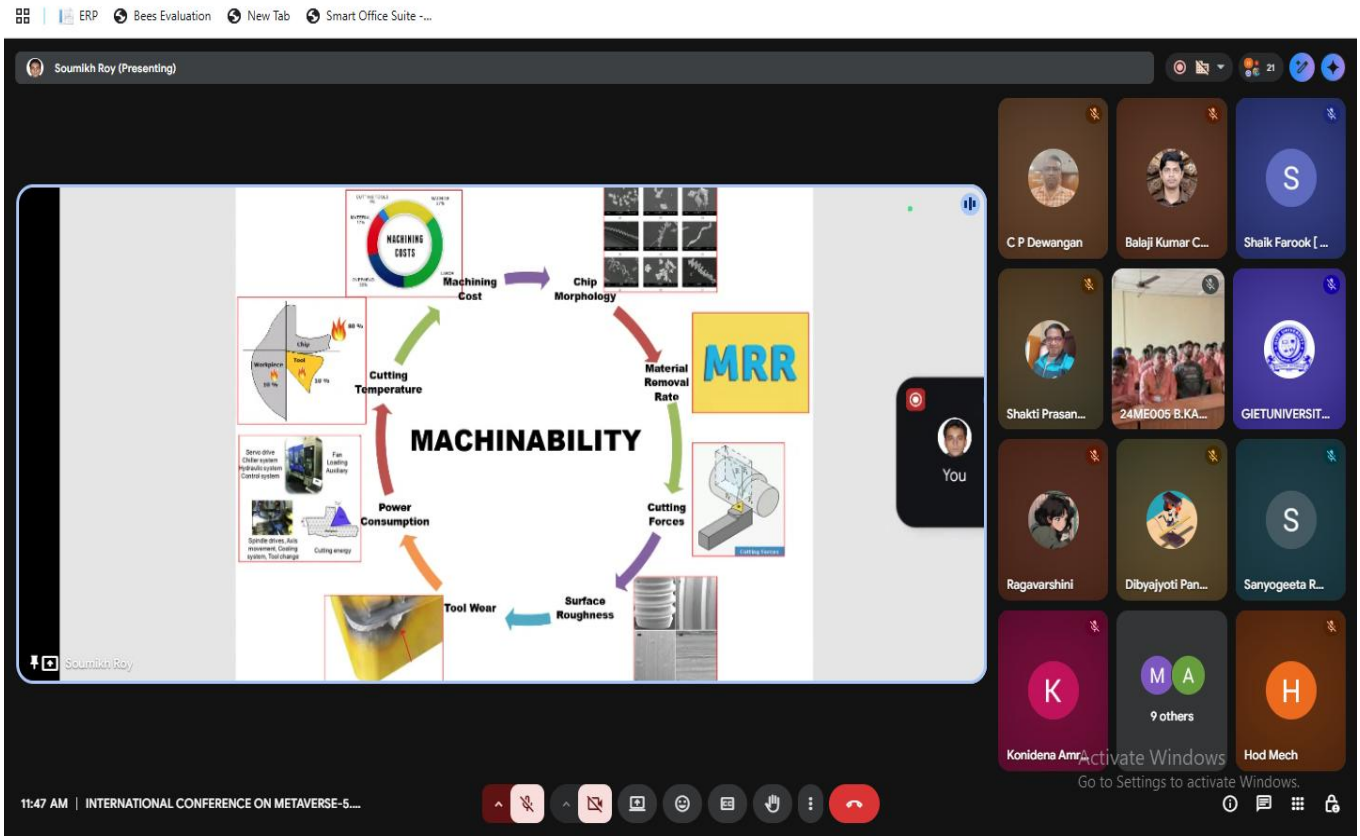
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Machining Cost
Chip Morphology
Material Removal Rate
MRR
Cutting Forces
Surface Roughness
Tool Wear
Power Consumption
Cutting Temperature
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Department of Mechatronics Engineering
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GIET University, Gunupur, Odisha, India
Low-Cost Semi-Automated Guided Vehicle with Servo-Mounted Ultrasonic Sensor for Free-Roaming Navigation in Small-Scale Industries
Presented by
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Co-Author's
K.SRIRAM NARAYANAN
Dr. P. BALASUNDAR, M.E., Ph.D.
Guided By
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Assistant Professor
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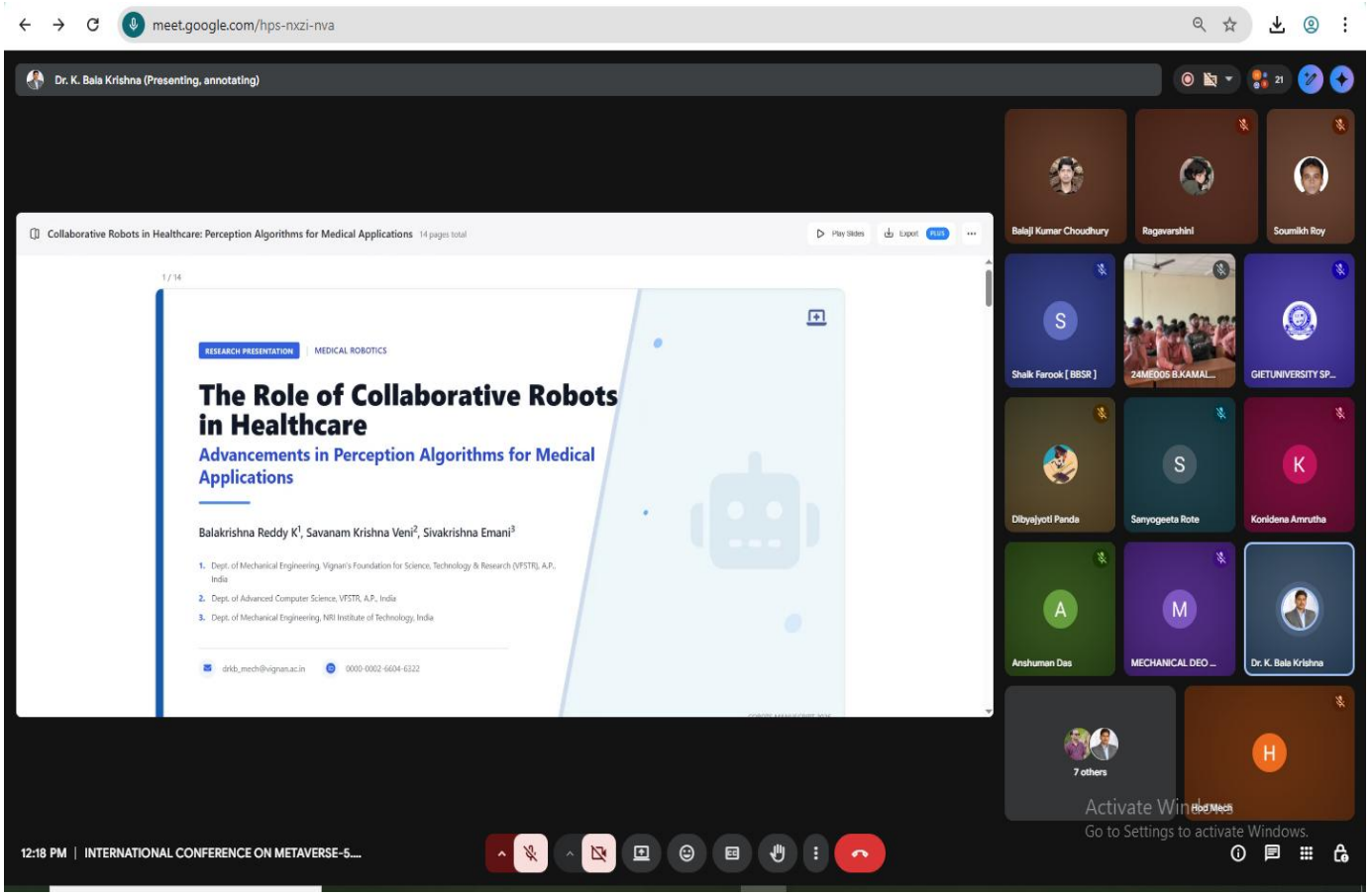
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Collaborative Robots in Healthcare: Perception Algorithms for Medical Applications 14 pages total
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The Role of Collaborative Robots in Healthcare
Advancements in Perception Algorithms for Medical Applications
Balakrishna Reddy K[1], Savanam Krishna Veni[2], Sivakrishna Emani[3]
1. Dept. of Mechanical Engineering, Vignan's Foundation for Science, Technology & Research (VFSTR), A.P., India
2. Dept. of Advanced Computer Science, VFSTR, A.P., India
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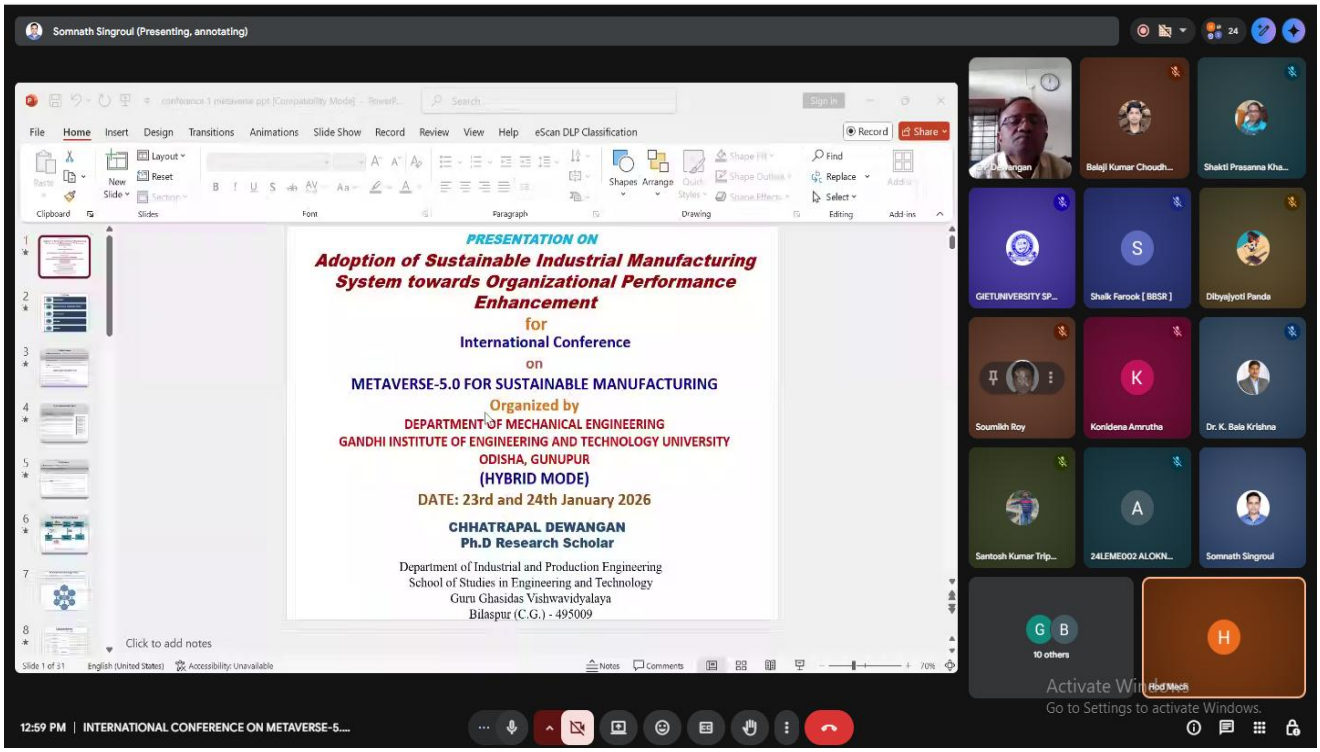
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PRESENTATION ON
Adoption of Sustainable Industrial Manufacturing System towards Organizational Performance Enhancement
for
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METAVERSE-5.0 FOR SUSTAINABLE MANUFACTURING
Organized by
DEPARTMENT OF MECHANICAL ENGINEERING
GANDHI INSTITUTE OF ENGINEERING AND TECHNOLOGY UNIVERSITY
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DATE: 23rd and 24th January 2026
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Ph.D Research Scholar
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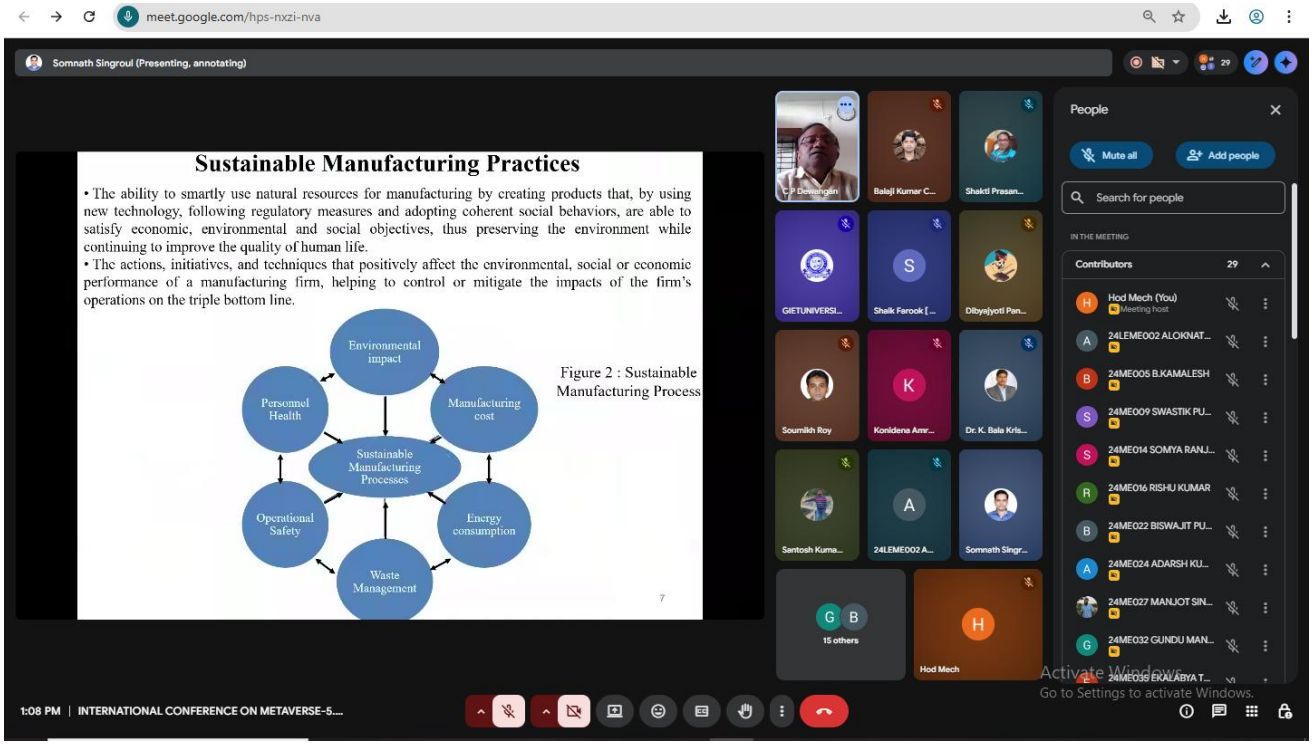
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Sustainable Manufacturing Practices
• The ability to smartly use natural resources for manufacturing by creating products that, by using new technology, following regulatory measures and adopting coherent social behaviors, are able to satisfy economic, environmental and social objectives, thus preserving the environment while continuing to improve the quality of human life.
• The actions, initiatives, and techniques that positively affect the environmental, social or economic performance of a manufacturing firm, helping to control or mitigate the impacts of the firm's operations on the triple bottom line.
Environmental impact
Manufacturing cost
Energy consumption
Waste Management
Operational Safety
Personnel Health
Sustainable Manufacturing Processes
Figure 2 : Sustainable Manufacturing Process
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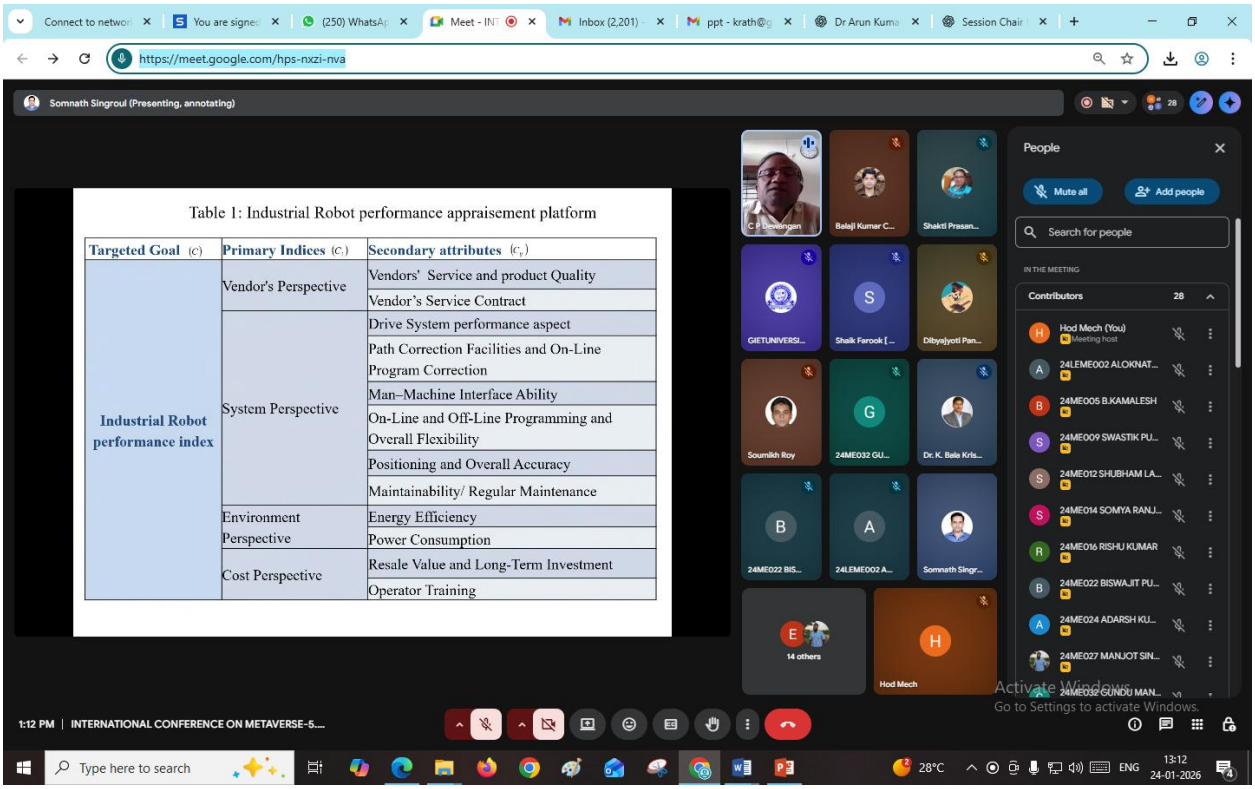
Somnath Singroul (Presenting, annotating)
Table 1: Industrial Robot performance appraisement platform
Targeted Goal (C)
Primary Indices (C_i)
Secondary attributes (C_ij)
Industrial Robot performance index
Vendor's Perspective
Vendors' Service and product Quality
Vendor's Service Contract
System Perspective
Drive System performance aspect
Path Correction Facilities and On-Line Program Correction
Man–Machine Interface Ability
On-Line and Off-Line Programming and Overall Flexibility
Positioning and Overall Accuracy
Maintainability/ Regular Maintenance
Environment Perspective
Energy Efficiency
Power Consumption
Cost Perspective
Resale Value and Long-Term Investment
Operator Training
People
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Step 3: Collective preferences assessed by Decision Makers in linguistic terms b for 2nd Level Attribute (C_ij) (Table 3).
Table 3: Appropriateness rating of secondary attributes collected the group of decision-makers (DMs)
Secondary Indices (C_ij)
Rating (U_ij)
Rating of each secondary indices
DM1 DM2 DM3 DM4 DM5
Vendors' Service and product Quality (C11) (U11) G F G G G
Vendor's Service Contract (C12) (U12) F F F F F
Drive System performance aspect (C21) (U21) G G G G G
Path Correction Facilities and On-Line Program Correction (C22) (U22) E VG E E E
Man–Machine Interface Ability (C23) (U23) VG G G VG VG
On-Line and Off-Line Programming and Overall Flexibility (C24) (U24) G VG G G G
Positioning and Overall Accuracy (C25) (U25) VG E VG VG VG
Maintainability/ Regular Maintenance (C26) (U26) VG G G G VG
Energy Efficiency (C31) (U31) VG E E E E
Power Consumption (C32) (U32) G G G G G
Resale Value and Long-Term Investment (C41) (U41) F G F F F
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5. Key Findings

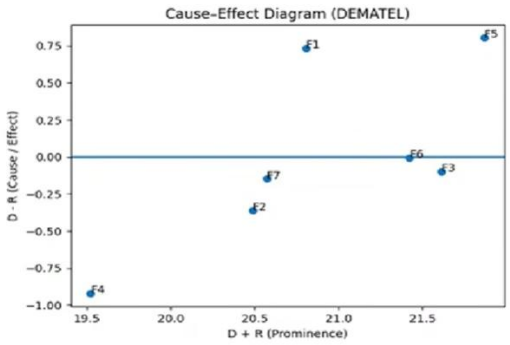

Figure 2: Cause-Effect Diagram

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ABSTRACT

- Accurate prediction of load–deflection behavior is essential for assessing the structural performance of mechanical and civil engineering components. This study presents a data-driven approach for analyzing the load–deflection response of a simply supported beam using a machine learning technique based on linear regression. Experimentally obtained load–deflection measurements are employed to develop a least-squares regression model. The results demonstrate that the proposed model effectively captures the linear relationship between applied load and mid-span deflection with minimal computational effort. A detailed numerical example, graphical validation, and Python-based implementation are provided to support the effectiveness of the approach. The study highlights the potential of simple machine learning methods as complementary tools to classical structural analysis.

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Example Problem

- **Problem Statement:** Predict the deflection of a simply supported beam for an applied load of 150 N using linear regression.
- **Solution:** Using the experimental dataset, the regression coefficients (slope and intercept) are obtained through least-squares fitting. Substituting the load value (x = 150 N) into the trained regression equation yields the predicted deflection.

This demonstrates the ability of the ML model to interpolate structural response values for intermediate loading conditions.

Experimental Setup

The experimental study was conducted using a standard simply supported beam testing apparatus. The beam was mounted on a pinned support at one end and a roller support at the opposite end to allow free rotation while preventing vertical displacement. A concentrated load was applied at the mid-span using calibrated weights.

Figure 1 shows the actual experimental setup used for measuring the load–deflection behavior of the simply supported beam.

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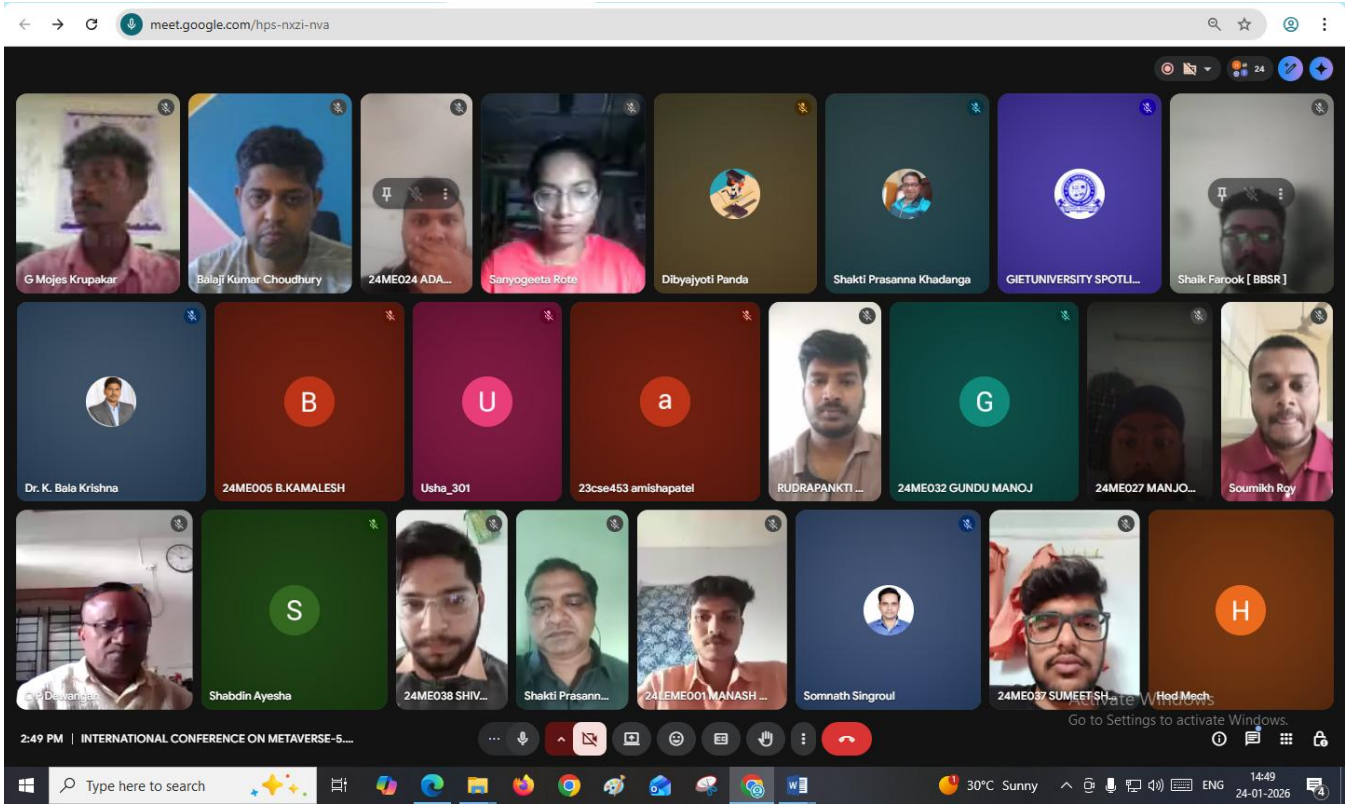
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Soumikh Roy
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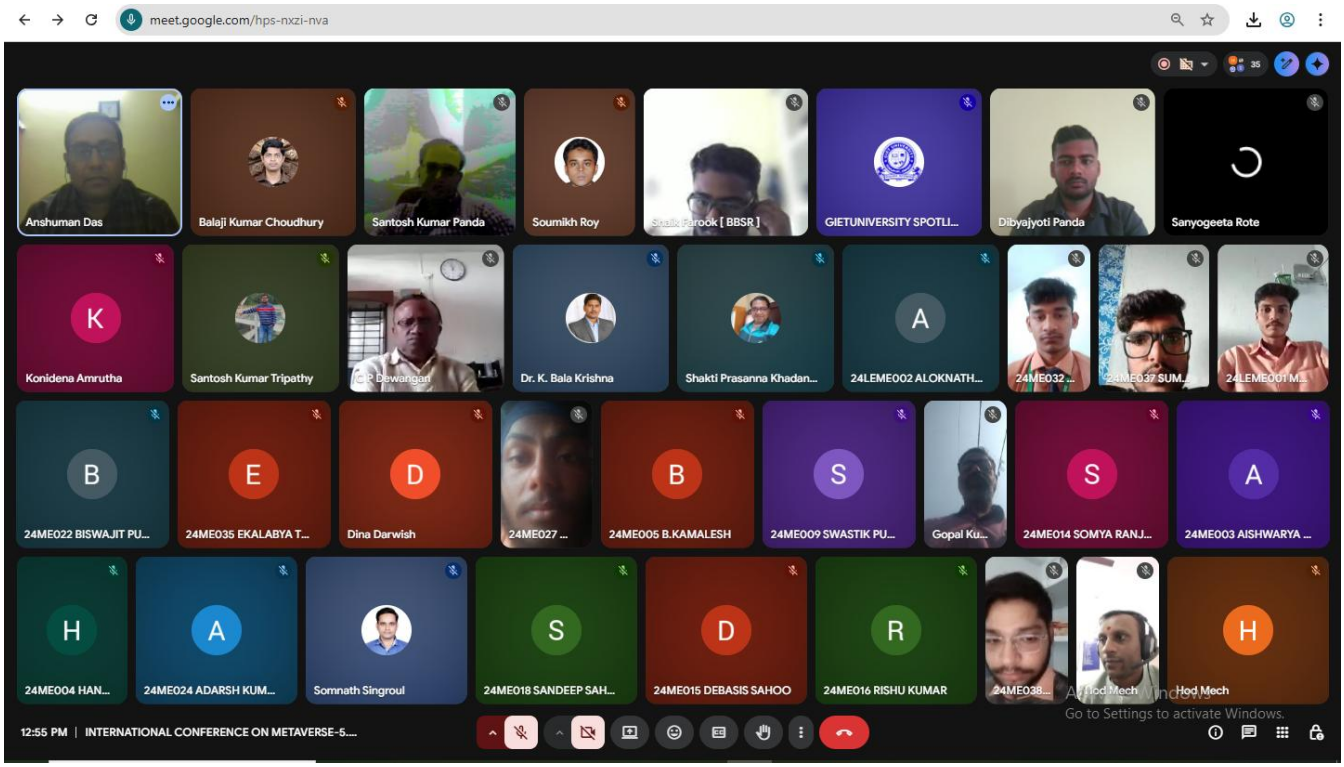
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24ME003 AISHWARYA ...
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24ME015 DEBASIS SAHOO
24ME016 RISHU KUMAR
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THANK YOU
SO MUCH

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